Credit and Investment in China: A Flow-of-Funds Analysis

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Abstract

This thesis presents a detailed flow-of-funds analysis of the Chinese economy since 1992. An original theoretical approach to endogenous money, investment and profits is developed alongside the empirical analysis.

It is argued that standard modern macroeconomic theory, such as the New Keynesian monetary macroeconomics and neoclassical growth theory are unsuited to the analysis of a long-run disequilibrium credit-financed investment-driven growth path such as that which has taken place in China.

Using an approach built on accounting foundations, rather than the optimising behaviour of representative agents, an analysis of credit creation, investment and growth is presented in which firms' investment expenditures are the key factor in determining the dynamic evolution of the system. Steindl's analysis of the "maldistribution of profits" is updated and re-worked in the context of state control over the "cartelised" firms' sector. It is argued that the credit-financed investment expenditures of the state-owned sector play the decisive role in generating the aggregate demand which has driven high growth rates in China, while simultaneously conditioning the outcomes in terms of profit generation, monetary expansion and the distribution of liquidity and leverage.

The development of the theoretical analysis is informed by a detailed empirical examination of the processes of money creation, investment and profits over the last twenty years in China. The empirical approach follows the theoretical analysis in that it is also based around the flow-of-funds national accounting system, resulting in an integrated and coherent analytical structure in which all transactions are matched by equivalent and opposite transactions elsewhere in the system.

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Chapter 1

Introduction

The growth performance of China since 1978, when market-oriented reforms were initiated, makes it one of the great success stories of recent economic history. This performance has generated considerable debate because it has taken place in a policy environment far removed from the idealised liberal market structure advocated by standard economic theory. Very high rates of growth have been achieved under a system of significant state ownership, strong restrictions on international capital movements and a financial system dominated by a few large state-owned banks. Furthermore, for much of this period, global economic performance was weak, with stagnation occurring in much of the developing world.

In an attempt to reconcile the obvious success of the Chinese case with the observation that China's policy mix does not match standard prescriptions, analysis and debate have focused on attempts to identify those factors which have enabled China to succeed despite such policy obstacles. This discussion has been framed under the assumption that the optimal institutional and policy structures for growth and development are those which conform to a liberalised market system based on private ownership. This implies that debate hinges on a discussion of those features of the Chinese economic and political system which may be considered as complying with such a market system, and those which continue to diverge from it.

In opposition to this dominant account of the Chinese experience is an alternative narrative which focuses on the specific form taken by China's transition to the market, and in particular on the role played by industrialisation. From the point of view of textbook theory, the capital-intensive industrial growth path taken by China appears contradictory, given the abundance of labour relative to

capital. However, this capital-intensive growth path can be explained with reference to the role played by increasing returns to scale in industry. In relating increases in labour productivity to investment expenditures, an analysis of the dynamic growth path taken by China can be constructed in which the role of government and the structure of institutions no longer appear paradoxical.

This thesis complements such an alternative interpretation of China's development by putting forward an original account of the characteristics of circulation and aggregate demand in the Chinese economy, during the period since the early 1990s in which growth has been led by high levels of investment in fixed capital. It is argued that China's performance is the outcome of a dynamic credit-investment process, in which the expenditures of firms are financed by a combination of loans extended by the state-owned banking system and the retained earnings of corporations. While growth has been driven by the productivity-enhancing effects of investment, this development path has been facilitated by a distinctive regime of monetary circulation and aggregate demand. In recent years this regime been additionally influenced by the effects of a significant trade surplus.

This characterisation of the demand and circulation regime of the Chinese economy is operationalised through the development of an original theoretical approach to endogenous money, aggregate demand and the distribution of profits, based on a re-interpretation of Steindl's analysis of the "maldistribution of profits". Using a modified version of the Kaleckian profit reflux mechanism, it is argued that the investment expenditures of state-owned firms have led to a concentration of profits in the private firms sector, while a disproportionate share of the associated liabilities remain the responsibility of those state-owned enterprises which have led this investment.

Central to this argument is the notion that the financial system plays a key role in accommodating the liquidity requirements of firms through endogenous credit creation. As such, the role played by the financial system is not primarily related to its efficiency or otherwise as an intermediary, allocating funds—in the form of household savings—to those investment projects that generate the highest marginal returns. The real significance lies in the role of the financial system, and the banking system in particular, as a creator of liquidity *ex-nihilo*, allowing firms to initiate expenditure on investment projects, generating new income which in turn results in increased savings and further economic growth. There is thus an important distinction, originating with Schumpeter ([1938] 2008), be-

tween static notions of allocative efficiency, and the potential dynamic productivity increases which can occur in a growing economy. Central to Schumpeter's analysis was the crucial importance of the use of bank credit in sustaining such a dynamic investment-led growth path.[1]

This thesis uses the flow-of-funds accounting system both as a basis for a theoretical account of this monetary credit-investment-growth process, and for an empirical study of the recent macroeconomic history of China. The flow-of-funds framework is used in the development of a stock-flow consistent model which integrates a Kaleckian growth model with a "pure credit" monetary system. This provides a theoretical basis for a detailed analysis of the Chinese flow-of-funds accounts, augmented with balance sheet data from the People's Bank of China and disaggregated data from various other sources

1.1 China's development path

The rapid growth of China is widely perceived as a "puzzle", since it has taken place despite apparently violating many of the the standard policy prescriptions: "The Chinese path of reform and its associated rapid growth is puzzling because it seems to defy... the conventional wisdom... China's reform succeeded without complete liberalization, without privatization, and without democratization" (Qian, 2003, p. 298). It is argued by Lo (2012) that attempts to interpret the Chinese growth experience in a way that is compatible with orthodox economic theory have centred on two main propositions:

> First, *concerning institutions*, it is claimed that China's reformed economic institutions have been a mix of market-conforming and market-supplanting elements, that its developmental achievements have been ascribable to the conforming elements while the accumulated problems have been ascribable to the supplanting elements, and that the problems have tended to outweigh the achievements ... Second, *concerning development*, it is claimed that differences in country-specific factors, most importantly the different levels of industrialization, have largely explained the contrast between China's sustained rapid growth and the depression in countries of the former Soviet bloc, and that this

[1] The function of banks as creators of new money, and thus as initiators of fresh circuits of economic production, originates with Hartley Withers' *The Meaning of Money* (1920), and was subsequently developed by Keynes ([1930] 1971, 1937b), Hayek (1933) and Schumpeter ([1938] 2008)

> contrast is largely unrelated to differences in the strategies of systemic transformation. (Lo, 2012, pp. 100–101)

The first of these propositions has become increasingly untenable, given that market-supplanting institutional forms have continued to prevail, while at the same time growth rates have remained persistently high. Adherents to the orthodox view of the primacy of private property and the liberal market system have thus fallen back on the second of these propositions, namely that the diverging experiences of China and the other transition economies of the former Soviet Union—which pursued a much more extreme set of liberalisation policies—can be attributed to differences in the initial conditions faced in each case. China's success can then be viewed as having occurred, in spite of the policy regime, as a consequence of low initial levels of industrialisation.

Another interpretation, recently been put forward, avoids these problems by simply arguing that the interpretation of the Chinese institutional environment is incorrect. In this view, "there is no China puzzle at all. The true China miracle is a classic and conventional one—the country grew because of private sector dynamism, a relatively supportive financial environment, and increasing property security." (Huang, 2008, p. 55). Proponents of this view argue that private property rights were established much earlier than is generally believed. Thus, the success of China is presented as a straightforward story of "virtuous" private entrepreneurship. It is argued that the private sector, after flourishing in the 1980s, was subsequently repressed in the 1990s as a result of increasing state bias against rural entrepreneurs and small and medium enterprises and in favour of large, inefficient, state-run corporations.

This view arose, in part, as a reaction against those theories which posit that the economic success of China is a result of the existence of apparently inefficient institutional structures, that have performed "as-if" they were efficient by operating as "second best" mechanisms that served to ameliorate the market failures that arise due to incomplete property rights and a weak financial system. This view has focused in particular on the role of town and village enterprises (TVEs) as a specific non-market institutional form that produces outcomes close to those optimal allocations that would arise in the presence of a functioning market (Che & Qian, 1988; Stiglitz, 2006). While this view represents a more nuanced understanding of the transition path taken by China, it still retains the implicit assumption that, in theory at least, the liberal market system represents the optimal

institutional structure. However, given the frictions and imperfections found in the real world, the sequencing of reforms in the transition towards the market becomes significant, implying that the existence of various non-market institutions can be justified during the transition period.

Common to the above viewpoints is the belief that China is suffering from "financial repression", resulting in market distortions which lead in turn to a misallocation of capital (McKinnon, 1973; Shaw, 1973). Chinese financial institutions are regarded as inefficient and biased against the private sector, resulting in a lack of credit availability for small and medium sized private enterprises, stifling innovation and progress (Lardy, 2008; Park & Sehrt, 2001).

At odds with these narratives stands an analytical account of the Chinese experience put forward by Lo (2012), based around the notion of dynamic increasing returns to scale, driven by technological change. The "Kaldor-Verdoorn" laws, associated with Nicholas Kaldor and Petrus Johannes Verdoorn, claim a positive relationship between the rate of growth in manufacturing, and the growth of productivity. In turn, this implies a relationship between aggregate demand and productivity growth. This account also emphasises the role of Schumpeterian innovation: it is argued that the institutional structures most conducive to the diffusion of technological change and the generation of innovative activity—such as the maintenance of long-term business relationships—will entail significant "rigidities" in the productive system. This view thus diverges significantly from the usual emphasis placed on "flexibility" in generating efficient allocative outcomes.

This thesis presents an original analysis of the Chinese regime of monetary circulation and aggregate demand which is complementary to this Kaldorian-Schumpeterian interpretation. In the account presented here, what is referred to by Lo & Li (2011) as the "capital deepening" period—from around the start of the 1990s—is characterised as representing an aggregate demand-led path of accumulation, driven by the investment expenditures of state-owned enterprises. This demand-led growth path has resulted in a rising share of "internal accumulation" on the part of private sector firms. Building on a novel theoretical synthesis of Kaleckian and Steindlian theory, it is argued that this process may be characterised as a dynamic "inverse Stendlian" process.

In Steindl's analysis, increasing monopolisation of manufacturing firms leads to greater concentration, reducing the profitability of "marginal" competitive firms and ultimately leading to stagnation as a result of declining investment. It is ar-

gued that, as a consequence of the inelasticity of the investment of state-owned firms with respect to excess capacity, the Chinese experience may be regarded as representing the inverse of this stagnationary Steindlian process. However, in line with Steindl's analysis, the high rates of saving that have accompanied this growth path have the potential to lead to stagnationary tendencies in the event that investment expenditures were to decline.

This investment-led growth path has been facilitated by the creation of new money by the commercial banking system, which in turn has been accommodated in its liquidity requirements by the People's Bank of China. In such a system, success in generating growth depends fundamentally upon newly created money being directed towards investment projects that both increase the capacity of the economy and generate aggregate demand (Herr, 2010). The potential for problems arises in the possibility of newly created liquidity being diverted into foreign assets or used for speculative purchases of financial or other assets. In this respect, restrictions on international capital movements and the relative underdevelopment of China's capital markets may be regarded as having worked in favour of a high-growth outcome: in approximating a Wicksellian "pure credit" economy in which alternative financial assets are largely absent, the capacity for speculative behaviour is curtailed.

A key feature of theories of endogenous money is the possibility for *ex ante* saving and investment to diverge. With the generation of additional spending power by bank lending, changes in aggregate income provide the mechanism by which saving is adjusted to the desired level of investment expenditure. It is thus argued that the tendency to focus on the behaviour of households as the driving force in generating high aggregate levels of saving—and thus investment—is misguided. This high saving rate of Chinese households has been viewed in some quarters as related to the recent "global imbalances" (eg. Bernanke, 2005). It is demonstrated that this view is mistaken for two reasons.

Firstly, in such a view, saving must be regarded as the active variable, such that changes to the rate of saving drive changes in the volume of investment and the balance of payments. In the credit-investment theory put forward here, the saving propensities of economic sectors influence aggregate demand, output, and the leverage of firms, but do not determine the volume of investment—and thus saving—which is the outcome of the investment decisions of firms.

Secondly, such a view places undue emphasis on the saving of households. Although high, the saving of the household sector is of secondary significance in

comparison with the saving of firms, in the form of retained earnings. Although there is an increasing awareness that firms' profits are an important driver of aggregate saving in China (eg. Ma & Yi, 2010; Kuijs, 2005), explaining this observation is problematic within the terms of reference of marginalist theories of distribution.

In contrast, the account presented here, based on the theories of Kalecki ([1933] 1990) and Steindl (1952), shows that the causal link between investment and the generation of profits is straightforward. At the aggregate level, the dynamics of credit-funded investment in combination with the Kaleckian profit reflux mechanism determine the saving of firms. Using enterprise survey data, it is shown that the relative degree of monopoly of the state-sector *vis-a-vis* the private sector, in conjunction with differential rates of investment between the sectors, has led to increasing relative profitability of private firms. Further, it is demonstrated that this "internal accumulation" in the firm sector is not, as would be predicted by conventional theory, leading to a reduction in the volume of the outstanding loans of the firm sector, but instead bank deposits are accumulating within the firm sector, resulting in "over-capitalisation" of firms, a phenomenon increasingly observed in advanced economies (Toporowski, 2008a).

Crucial to the success of a credit-investment process of this type is the role played by the central bank in the provision and regulation of liquidity. The task of the Peoples' Bank of China is complicated in this respect by the restrictions imposed by a closely-managed currency and significant foreign exchange inflows. It is argued that the commonly held view that the Peoples Bank of China has operated a system of base money targeting, in line with monetarist doctrines, is misleading. The banking system has maintained significant volumes of excess reserves over the period of analysis, making it unlikely that lending has been restrained through the direct control of bank reserves.

Finally, it should be emphasised that this thesis presents a characterisation of the demand and circulation regime of the Chinese economy in terms of the relationships between aggregate demand and monetary and financial variables, but does not engage to any significant degree with supply-side considerations such as productivity growth, technological innovation and so on. As such, the analysis presented here can be regarded as representing only a partial account of the recent development of the Chinese economy. The advantage this approach lies with the ability to isolate of a few key relationships for detailed study, while leaving other dynamics in the background of the analysis.

1.2 The flow-of-funds

The account given in this thesis of the circulation and aggregate demand characteristics of the Chinese growth path is organised around the flow-of-funds accounting system. The flow-of-funds, originally devised by Copeland (1947, 1949), is an accounting system in which financial and real-sector flows are integrated into an internally consistent, systematic and coherent macroeconomic framework. In this framework, the macroeconomic system is disaggregated by sector—usually households, firms, financial institutions, the government and the foreign sector—and a double-entry book-keeping system used to track the balance sheet effects of all inward and outward flows, both real and financial, for each sector.

The result is a system in which the inter-sectoral imbalances that arise as a result of real investment, saving and capital accumulation may be directly integrated with the accommodating financial and monetary flows that occur between surplus and deficit economic sectors. Economic processes generate a sequence of interconnected balance sheets such that all flows have both a ”source” and a ”use”, resulting in an internally consistent system which readily lends itself to an integrated analysis of aggregate demand; saving, investment and accumulation; money creation and the mechanics of financial markets; and the functional distribution of income—all within a coherent and unified framework.

This thesis uses the flow-of-funds accounting system in two connected ways. Firstly, the framework is used as the basis for a theoretical analysis of the processes of money creation, investment and saving in a “pure credit” system. It is argued that models constructed on the basis of accounting relationships provide a viable alternative to the currently dominant optimising-agent macroeconomic modelling paradigm based on the “new consensus” monetary models and “new growth” models. Models formulated on the basis of an aggregate production function suffer from intractable conceptual inconsistencies, while representative agent-based Walrasian general equilibrium models are fundamentally unsuited to the analysis of long-term disequilibrium monetary processes. An alternative theoretical approach to the characterisation of the monetary demand regime is thus taken, based on the flow-of-funds accounting system. This theoretical framework is developed initially through the analysis of a sequence of flow models which move from a simple system of bank lending through to the more complex cases of firm over-capitalisation, speculation and asset-price inflation.

A growth model is then integrated with this monetary system. A number of

alternative theoretical approaches to growth are surveyed, including the Cambridge growth models of the 1950s and 1960s, and the more recent Kaleckian growth models. It is argued that, following Lavoie & Godley (2001), the incorporation of a Kaleckian growth model—in which excess capacity may persist even in the long run—into a flow-of-funds accounting system provides a viable basis from which to construct more complex and institutionally specific models. This model is used to demonstrate a number of results related to the modified Steindlian theoretical framework developed in this thesis.

Secondly, a detailed analysis of the Chinese flow-of-funds accounts is presented. These accounts are used as the basis for an empirical study of recent Chinese economic history, ensuring a coherent analysis of the interactions between real and financial variables. The official Chinese flow-of-funds accounts, published by the statistical authorities, are updated and augmented using central bank balance sheet data and enterprise survey data, to allow for the disaggregation of the financial institutions sector and the firms sector beyond the level of the official statistics.

This empirical analysis gives a detailed picture of the dynamics of saving and investment over a period of around twenty years. These processes are tracked at the sectoral level, allowing for an analysis of the evolution of household and firms' behaviour, the associated financial balances, and the resulting changes in stocks of financial assets and liabilities, primarily bank loans and deposits. The government and external sector are integrated into the analysis, and the role of the central bank in accommodating the reserve requirements of banks is analysed in the context of the sterilisation requirements arising from the recent current account surpluses.

It is shown is that a number of common narratives about the Chinese experience are not borne out by the data: high rates of aggregate saving are increasingly arising as a result of firms' retained earnings, rather than household saving. As a result, the net financial deficit of the firms sector is falling, and firms at the aggregate level are accumulating bank deposits at a rate close to that at which they are taking on new loans. Within the firms sector, state-owned firms do not appear to conform to the role, which they are often assigned, of a loss-making drag on output. Profit margins are rising in both the SOE and private sectors, while the household and wage shares in national income are falling.

The financial flow positions of each sector are analysed in detail and the monetary policy and sterilisation operations of the central bank integrated with the

account of the behaviour of the state-owned banking system. It is shown that although the firms sector is increasingly able to finance investment out of retained earnings, the observed structure of monetary and financial flows strongly supports the hypothesis of an endogenous credit-investment process. Such a process is incompatible with the PBC's claim that its implementation of monetary policy is based on control of high-powered money, and thus broader monetary and credit aggregates via a stable money multiplier. It is demonstrated that the levels of excess liquidity within the banking system largely preclude such an approach from being effective.

These trends are then evaluated in the light of the alternative analytical framework developed in this thesis. It is argued that the patterns of expenditure and distribution are better explained by the "inverse Steindlian" theory presented here.

1.3 Thesis outline

The thesis is organised as follows. Chapter 2 presents a review of current theoretical approaches to monetary macroeconomics and growth. The New Keynesian monetary economics and neoclassical growth models are examined in detail. It is argued that these theoretical systems suffer from serious flaws, both in general terms and with respect to the the analysis of China.

An alternative approach to monetary analysis is developed in Chapter 3, with the construction of a "pure-credit" stock-flow system. This system is first used to demonstrate a number of simple "edge-case" systems wherein investment is either purely funded by the saving of households or by the retained earning of firms. The system is then augmented through the introduction of equity markets, leading to a discussion of the more advanced cases of speculative market behaviour, capital market inflation, and firm over-capitalisation. Conceptual difficulties for flow-of-funds-based modelling due to issues such as intra-sectoral trading and accounting for capital gains are explored. The effect of a current account surplus in the context of inflexible exchange rates is examined, with a particular focus on the resulting sterilisation operations of the central bank.

Chapter 4 brings the real sector into the theoretical framework. A survey is presented of those theories of growth and distribution that offer an alternative to the standard aggregate production function approach. The Cambridge growth models of the 1950s and 1960s are discussed, followed by the stagnation theory of

Steindl and the more recent post-Keynesian or Kaleckian models. The Kaleckian growth model is integrated with the pure credit system developed in the previous chapter. The resulting monetary growth model is used to illustrate the Steindlian theoretical framework used as the basis for the empirical flow-of-funds analysis in the later chapters.

The subsequent three chapters focus on the empirical analysis of China. Chapter 5 analyses the evolution of the Chinese financial system during the transition from a centrally planned system. An overview is given of the institutional structure of the financial system and the operating procedures of the Peoples' Bank of China are reviewed and discussed.

Chapters 6 and 7 are the core empirical chapters of the thesis. These chapters contain a detailed study of the Chinese flow-of-funds. The analysis is split over two chapters to allow for a detailed study of both real flows, in Chapter 6, and the associated financial flows in Chapter 7.

Chapter 6 examines the saving and investment behaviour of households and firms, and analyses the resulting net financial balances. It is shown that high aggregate saving is not primarily a result of the saving behaviour of households, but arises from the dynamics of investment and retained profits in the firms sector. This chapter further develops the Steindlian theory presented in Chapter 4 in the context of an examination of firm data which is disaggregated to the level of different ownership types.

Chapter 7 presents the financial counterpart to the physical flow-of-funds analysis of in Chapter 6. The financial flow positions of each sector are analysed in detail, allowing for the changes in stocks of financial assets and liabilities to be connected with the saving and investment balances analysed in the previous chapter. The monetary policy and sterilisation operations of the central bank are brought into the analysis. Chapter 8 concludes.

Finally, a note should be made regarding the sequencing of the thesis. For the sake of clarity, theoretical material and empirical analysis are presented separately. This may lead to the impression that the theoretical framework was developed in advance of, and independently of, the empirical material. This is not the case: the theoretical and empirical analysis were developed simultaneously, with each informing and influencing the other. In particular, the "inverse Steindlian" theory of the investment and financing of different types of firms represents an attempt to provide a characterisation of the specific demand and circulation regime of the Chinese economy which fits the stylised facts.

Part I

Theory

Chapter 2

Modern theories of money and growth

2.1 Introduction

This thesis aims to develop a theoretically coherent analysis of the evolution of saving and investment in China and the interaction of these processes via the financial system. Central to any such analysis is the role of the central bank in regulating these processes through the implementation of monetary policy and the influence held over the largely state-owned banking system. An analysis of the conduct of monetary policy in China, and of the relationship between monetary factors and the dynamics of savings and investment, will provide insights into the international disequilibrium processes that characterised the period before the global financial crisis which began in 2007, as well as the conduct of monetary policy in developing and transition economies.

The monetary analysis will be complemented by a study of the real-sector processes which generate the sectoral imbalances which drive credit and monetary relationships. These sectoral balances can only be understood in the context of the very high rates of growth in China, the disequilibrium processes that have driven this growth, and the outcomes of these processes in terms of income distribution, investment and saving.

The starting point for the analysis is the construction of a theoretical system which integrates these real and monetary factors in a coherent manner. This chapter explores the current "state of the art" theoretical literature on monetary macroeconomics and economic growth and considers the validity and relevance

of these approaches—both in general terms, and for the specific case of the analysis of the Chinese economy.

Two main theoretical strands are examined: the New Keynesian approach to monetary macroeconomics and the neoclassical approach to economic growth. It is argued that these currently fashionable approaches, organised around the concept of the steady state in dynamic general equilibrium systems, are inadequate for the the analysis of the dynamics of money and credit creation; and growth and distribution in China.

The essentially non-monetary nature of the New Keynesian model, based on Walrasian general equilibrium, is unsuited to the analysis of a long-run disequilibrium process in which credit-financed investment drives the dynamics of money, credit and sectoral imbalances. The profound structural and institutional changes that have occurred in the context of high rates of growth imply that only an analysis which is not fundamentally centred on the concept of long-run equilibrium, will generate valid results.

2.2 New Keynesian monetary theory

2.2.1 Overview

The term "New Keynesian monetary theory" covers a range of related approaches to constructing models which rely on market imperfections or frictions to generate their results. A number of different terms have been used to cover some or all of these models, for example "New Neoclassical Synthesis", and "neo-Wicksellian" as well as the broader "New Consensus" which incorporates both theoretical models and the associated policy conclusions. These conclusions are centred on the assertion that monetary policy should be implemented using an inflation-targeting regime which is carried out through the steering of short-term interest rates in accordance with a known rule. The "consensus" refers to the increasing degree of alignment on this point between the views of policy-makers and academics (Goodfriend, 2007).

Two distinct themes exist within this theoretical framework. The first comprises a series of models which use frictions—most commonly asymmetric access to information—to generate justifications for the existence of monetary phenomena, and in particular the holding of money in equilibrium. By assuming that creditors and debtors have unequal knowledge about the risks or outcomes of in-

vestment projects, explanations can be found for holdings of liabilities of financial intermediaries in models populated by otherwise rational optimising agents.

These models typically assign to financial intermediaries the role of some kind of "delegated monitoring". The collective cost to risk-averse lenders of monitoring the behaviour of creditors turns out to be minimised when they hold the liabilities of financial institutions which in turn hold a diversified portfolio of assets (Diamond, 1984). A number of contractual forms emerge from these models including the standard debt contract (Gale & Hellwig, 1985) and the bank deposit (Diamond & Dybvig, 1983). The latter of these is characterised by multiple equilibria, one of which is a scramble for liquidity akin to a bank run.

The second type of model is intended for use in analysing the out-of-equilibrium effects of *monetary policy*—rather than as a way to provide a rationale for the existence of money itself. Surprisingly, in these models, money plays no role—monetary policy is implemented solely on the basis of fixing interest rates. These models became the core forecasting tools of central banks in the period up until the financial crisis.[1] Despite the New Keynesian label these models in fact owe as much to the Real Business Cycle (RBC) models of Kydland & Prescott (1982) and others as they do to the market imperfections approach of Akerlof and Stiglitz.

It is this second type of theory that is the main focus of this section. These dynamic-stochastic general equilibrium models emerged as a synthesis between the dominant RBC approach to macroeconomic modelling and the more recent approach based around the introduction of rigidities into general equilibrium models. In retaining the core of the RBC methodology, such as representative-agent modelling under the assumption of rational expectations, but introducing additional features such as sticky prices and monopolistic competition, the New Keynesian models were viewed as injecting a degree of realism into RBC models, particularly with respect to monetary policy. These RBC models had come under attack because the empirical evidence didn't appear to conform to their predictions of the neutrality of expected monetary policy. At the same time, the New Keynesian models were viewed as better suited to explaining real-world phenomena while retaining the theoretical rigour associated with the RBC framework.

Several versions of the "baseline" New Keynesian model exist alongside a large number of other implementations which incorporate various modifications.

[1] Eg. Bank of England (2005)

Presentations of the "canonical" New Keynesian model can be found in Goodfriend & King (1997), Clarida et al. (1999) and Galí (2008), while the most detailed exposition is presented in Woodford's *Interest and Prices* (2003).

The core of these models is what Galí (2008) refers to as a "Classical Monetary Model". This is a dynamic RBC system of equations in which an infinitely lived representative household maximises expected utility, subject to a series of flow budget constraints.

This household is able to adjust between future and current consumption of the model's single good by holding financial assets, one of which is a "distinguished monetary asset" issued by the central bank, and upon which the central bank is able to determine the rate of return. This "money" asset holds no function in the system as a means of transaction, or a store of value:

> The key role of money emphasised in the new monetary models is its function as a unit of account—that is, as the unit in which the prices of goods and assets are quoted. The existence of money thus gives rise to nominal prices. It is important, however, to distinguish between money and monetary policy: Monetary policy affects real activity in the short run purely through its effect on market interest rates... Because real money balances are a negligible component of total wealth, the models are designed in a way that abstracts from wealth effects of money on spending. Thus, while monetary policy is central in these models, money per se plays no role other than to provide a unit of account. (Galí & Gertler, 2007, pp. 28–29)

This role of money as a pure unit of account leads Woodford to characterise his system as a "pure credit" economy, a system originally conceived by Wicksell in his 1898 book *Interest and Prices* (1936), and explicitly acknowledged in the title of Woodford's book.

To the equations representing the inter-temporal choice of the household is added a firm, usually represented as a Cobb-Douglas production function and parameterised such that technology follows some exogenous stochastic process. This system of equations can then be solved to find a labour-supply function, and hence the level of employment and output. The dynamics of this "Classical" core model will then result from shocks arising from the stochastic technology parameter or shifts in household preferences. Alternative ways of specifying the

way in which monetary policy is conducted therefore have no effect on real outcomes since utility is a function of real income and is unaffected by changes to the nominal price.[2]

In order to give monetary policy traction, imperfections of some kind need to be introduced into the model. It is these frictions that are the defining features of the new consensus models. Firstly, a system of monopolistic competition is introduced, along the lines of Dixit & Stiglitz (1977). Instead of a single good, it is assumed there are a continuum of goods, produced by a continuum of firms. Secondly, a system of sticky price adjustment is introduced such that, in each time period, only a given fraction of producers will adjust their prices—a system referred to as Calvo pricing after its originator, Guillermo Calvo (1983).

Under the first assumption of monopolistic competition, even in the absence of sticky prices, each firm will be in a position to set the price of output at a point above the marginal cost of production. Once Calvo-pricing is introduced, changes to the nominal rate of interest will affect the real short-term rate of interest, resulting in shifts in aggregate demand.

The aggregate demand function of the system can be specified in terms of the deviation of the interest rate from the natural rate of interest that would prevail in the case of flexible prices. Referring to the equilibrium rate of output as the "natural rate of output", and the deviation from it as the "output gap", this aggregate demand function can be used to derive an IS relationship connecting changes in the rate of interest and changes in output. This IS function specifies the proportional relationship between the output gap and the difference between the current real rate of interest and the natural rate of interest.

The aggregate supply function of the model is derived from the price-setting behaviour of firms. Given the presence of Calvo-pricing, only a proportion of total firms will adjust their prices in each period. Those firms that are unable to adjust their prices in any given period will simply supply the quantity demanded, resulting in a counter-cyclical mark-up.

Combining these IS and AS functions, a relationship can be derived between the output gap and inflation. This celebrated result is known as the New Keyne-

[2]This may be overcome by including real balances in the utility function. However this can lead to further problems, depending on the form of the utility function. If utility is non-separable in income and real balances, monetary policy becomes non-neutral, but in the face of a shock that causes nominal rates to rise, real rates decrease along with inflation. The optimal policy is thus the 'Friedman Rule', a constant zero nominal interest rate, under which the system exhibits constant steady-state deflation at the rate of the representative household's time preference. (Galí, 2008, p. 34)

sian Phillips Curve (NKPC). Since agents in the model are assumed to be forward-looking, inflation, demand and the price-setting of firms are all determined on the basis of future as well as current values. Inflation is thus a function of expected inflation and the output gap.

These two relationships, sometimes referred to as an IS-AS system, are the centre-piece of the New Keynesian models. The causal structure of this system is summarised in Figure 2.1. The natural rate of interest is determined purely by the exogenous stochastic process that represents technology, and the preferences of the representative household. The difference between this natural rate and the actual real rate of interest determines the output gap (the IS relationship), which in turn leads to the level of price inflation in the system (the NKPC). In order to close the model, a third relationship needs to be added to this IS-AS system describing how nominal rates of interest are related to inflation. Since the nominal rate of interest is assumed to be set by the authorities, substituting different functional forms to close the model allows the testing of alternative "policy rules".

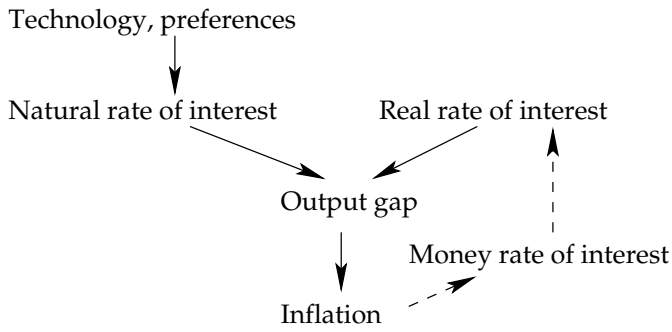


Figure 2.1 – Causal structure of the New Keynesian model.

The proponents of this class of models argue that they provide a useful experimental framework, within which different ways of implementing monetary policy can be examined. Experiments are conducted by specifying alternative ways for the central bank to respond to changes in inflation and the output gap, and using simulations to examine the outcomes of these alternatives in terms of the effects on inflation, output and welfare. What is demonstrated is that inflation can be fully stabilised through the credible commitment to a Taylor-type policy rule of the following form:

$$i_t = \bar{i} + \Phi_{\Pi}\Pi_t + \Phi_{\bar{y}}\bar{y}_t \tag{2.1}$$

Under a rule of this type (where i_t is the nominal rate of interest, Π is the rate of inflation and $\bar{y}_t$ is the output gap, and the parameters Φ_Π and $\Phi_{\bar{y}}$ represent policy variables), inflation will be stabilised at zero as long as $\bar{i}$ is fixed at the natural rate of interest. Further, it can be shown that there is an equivalence between stabilising the rate of inflation, and stabilising the mark-up charged by firms to the level that would prevail under flexible prices. Since welfare reductions in a system of this type result from deviations of prices from the flexible-price equilibrium, there is thus an equivalence between stabilising inflation and welfare maximisation—even though there exists a short-term trade-off between inflation and output, the Pareto-optimal solution is to stabilise inflation.[3] The New Keynesian model thus provides the theoretical justification for the inflation-targeting frameworks that have become the de-facto standard in central banks around the world.

It is this system of using the nominal rate of interest for stabilising deviations from the natural rate of output and—thus inflation—that makes the system "Wicksellian" according to Woodford.

> ...the present theory of interest determination has a distinctly Wicksellian flavour: Variations in the rate of inflation depend on the interactions between the real factors that determine the natural rate of interest, on the one hand, and the way in which the central bank adjusts short-term nominal interest rates, on the other. (Woodford, 2003, p. 84)

Having outlined the basic theoretical framework, a number of points are now examined in more detail, and the strengths and weaknesses of this approach considered.

2.2.2 Monetary policy without money

The theoretical significance of quantitative measures of money, and the money supply in particular, diminished with the shift in financially developed nations away from the monetarist doctrines which held that credit should be regulated through adjustments to the supply of base money. This view held that, via the

[3] Blanchard & Galí (2005) show that this "divine coincidence" depends on the assumption of perfect labour markets. The introduction of real wage rigidities into the model removes the equivalence between stabilisation of the output gap—the welfare maximising solution—and stabilisation of inflation, implying that policy-makers face a trade-off between these two objectives.

existence of a set of stable multiplier relationships, alterations to the amount of high-powered money supplied by the central bank would in turn result in proportionate changes to broader monetary aggregates.

The influence of the monetarist view decreased in the face of both empirical difficulties, and theoretical developments. The recent new consensus, associated with the New Keynesian theoretical framework, amounts to a rejection of the monetarist position, and instead argues that the short-term rate of interest is the correct operational target for monetary policy. This academic shift was welcomed by central bankers as recognition that the way they had long considered monetary policy to be conducted was now being taken seriously.

The view of central bankers that monetary policy implementation is primarily a task of fixing short-term interest rates is also one of the central claims of the post-Keynesian school of thought, a long-standing source of opposition to the previous monetarist doctrines. This approach emphasises the fact that that money is provided by private institutions—the commercial banking system—and argues that money is created on demand in order to provide loans to credit-worthy borrowers.

This creation of new money by the banking system is accommodated by the provision of reserves by the central bank. These public liabilities are required by the banking system to make up for those deposits lost through conversion to cash by the public, and to fulfil regulatory requirements imposed by the authorities. The supply of money is thus an endogenous, demand-led phenomenon with new money passively created by the banking system as the counterpart liability to the addition of new loans to the asset side of banks' balance sheets.

The degree to which the provision of new loans and deposits is limitless at a given rate of interest is a source of debate within the post-Keynesian school, with "horizontalists" arguing that the money supply is perfectly elastic, while the "structuralist" strand argue in favour of a slightly upward sloping money supply function (Moore, 1988; Dow, 2006). The horizontalist position is summarised as follows:

> [T]he *base* interest rate is not a market phenomenon: it is a bureaucratically determined price, which may be more or less influenced by the political class and the financial lobby... While the central bank only indirectly influences the monetary aggregates, it can fix the base interest rate with absolute precision... As a result the money supply

> curve, in symmetry to the supply-offer curve for the goods supplied by megacorps, is best seen as a horizontal curve (Lavoie, 1996, p. 278, emphasis in original).

The new consensus appears to mark a significant shift in modelling of the monetary system towards a recognition of the post-Keynesian position that the quantity of money is not a variable over which the central bank operates any direct control. However, this apparent similarity obscures significant differences between the two theoretical systems, in particular with the respect to the role of money within the economic system.

In the post-Keynesian view, as well as that of earlier neoclassical economists such as Wicksell, the demand for money is driven primarily by the liquidity needs of firms, for the purposes of investment.[4] By creating new loans, banks can create additional purchasing power, allowing investment to take place without a prior decision to save by households. The additional income generated through investment expenditure accumulates as the deposits of either households or firms. These deposits may then be used to finance further expenditures, exchanged for other, less liquid securities, or held as liquid balances.

In this view, money operates as a means of transaction and potential store of value as well as the numeraire. Whether inflation results from additional credit-financed expenditures depends primarily on the level of employment: as long as unemployed labour and excess capacity exist, additional expenditures will tend to increase output and employment, rather than affecting the price level.

The question of what determines the demand for money in the "pure credit" system assumed in the New Keynesian models has been the subject of some debate.[5] The concept of the pure credit economy originates with Wicksell's system, in which credit money is created by an integrated banking system and supplied to firms for the purpose of financing working capital and wage payments. Once production is complete, sales of goods by firms generate revenues which allow the repayment of loans, thus destroying the previously created credit money and returning the system to its starting state. Inflation arises in such a system when the banking system supplies credit to firms at a rate below the natural rate of interest. By holding the money rate of interest below the natural rate, the central

[4]Keynes used the term "neoclassical" in the *General Theory* to identify those theorists who, unlike "classical" economists, accepted the possibility of inequality between planned saving and investment. (Toporowski, 2008b).

[5]See, for example, Costa & DeGrauwe (2001); Boianovsky & Trautwein (2006)

bank can set in motion a cumulative disequilibrium process such that prices rise at an increasing rate while greater volumes of money circulate for production and goods sales.

The "neo-Wicksellian" framework described by Woodford in his own *Interest and Prices* refers to a base-line system in which cash and central bank reserves—monetary "frictions"—are assumed to be insignificant enough to be ignored. At the same time, it is assumed that the authorities are able to fix the nominal return on some riskless asset which, in turn, determines the nominal returns on all other financial assets in the system. Thus, in the absence of cash the government issues an asset which provides no services to the holder, but provides the holder with a nominal return (set by the central bank) denominated in terms of itself. It is argued that in such a system, changes can be made to the rate of interest paid on this asset—without affecting the quantity of the asset held by agents—which will in turn alter the rates of return of every other asset within the system.

The way that the monetary transmission mechanism is presented varies across the models, but the baseline case assumes perfect financial markets, allowing the representative household to exactly satisfy its optimisation problem over consumption and saving, both in the current period and over the expected future time horizon:

> In the baseline model, both capital and insurance markets are perfect. Within this frictionless setting, the household satisfies exactly its optimizing condition for consumption/saving decisions. It thus adjusts its expected consumption growth positively to movements in the expected real interest rate. Similarly, with perfect capital markets, the representative firm satisfies exactly its optimizing condition for investment: it varies investment proportionately with Tobin's q, the ratio of the shadow value of installed capital to the replacement value (Galí & Gertler, 2007, p. 30)

The transmission mechanism in Woodford's model is designed such that households are presented with "complete financial markets" as well as the option of holding a purely riskless asset in addition to the monetary liability of the government, giving them a choice between holding riskless "bonds" and "money". These assets are both issued by the government, such that the government's fiscal position is thus represented by the total quantity of these riskless assets held by the private sector.

Since the rate of return on bonds and money must be equal due to arbitrage opportunities (households are assumed able to borrow as well as lend at the riskless rate), the composition of demand between the two assets is indeterminate. However, Woodford assumes that households will at all times hold a non-zero quantity of money, in preference to bonds. The central bank is thus able to displace, in arbitrary quantities and with its own liabilities, alternative assets with identical risk and return characteristics.

Without a transactional demand for money balances, the rationale for holding money is undefined, leaving the demand for money, other than being positive by assumption, indeterminate: "...there will not actually be determinate demands for individual assets (the assumption in the case of the monetary base)." (Woodford, 2003, p. 65) Once the assumption has been made that households will choose to hold some level of money balances, arbitrage relations ensure that the bond rate of interest will remain pegged to the money rate. The distinction between money and bonds then becomes largely irrelevant, and Woodford is able to proceed as if the central bank controls the "market" rate of interest directly.

In a modern monetary economic system there exist two types of money: that which is issued by the central bank—cash and reserves or clearing balances—and that which is issued by the commercial banking system—bank deposits of various maturities. This distinction gives rise to the well-known Gurley and Shaw (1960) definition of financial development: an increase in the ratio of "inside money" to "outside money" (Toporowski, 2007). Each of these two types of liability will be backed by certain assets on the balance sheet of the issuing bank. In general, the liabilities issued by the central bank are backed by holdings of government debt, which in turn represent past government expenditures. In a financially developed system, however, these represent only a small proportion of total monetary liabilities. The majority of the monetary assets held by households are represented by the liabilities of commercial banks, which are backed, on the asset side of banks' balance sheets, by loans to firms. These loans are generally issued for the purpose of investment in working capital and to cover wages in advance of sales. The willingness of households to hold deposits—the liabilities of commercial banks—is thus related to the fact that they have confidence that those deposits will be accepted at some point in the future as payment for goods, and thus that the loan-making decisions made by banks are sound.

The pure credit economy of the new consensus models then may be seen as a system which has reached the limiting case in which the ratio of inside to outside

money becomes infinite. The theoretical difficulties that occur when dealing with such a system have been the subject of considerable debate, going back to Fisher Black's (1970) argument that a system of purely private-sector financial intermediation would be unaffected by the actions of a central bank, leaving the price level purely determined by the self-fulfilling expectations of the private sector. Woodford uses a combination of two arguments to confront this issue.

Firstly he argues that the pure credit economy is the limiting case of a system in which a small quantity of central bank balances are demanded for clearing purposes and can thus be used to illustrate the frictionless case, in the same way that a physicist does "when analysing the motion of a pendulum or the trajectory of a cannonball." (2003). This is a problematic analogy however, because the "non-frictionless" case to which he is comparing his system is one in which the demand for clearing balances arises from the needs of commercial banks, which in turn issue their own money in response to demand for investment funds by firms. This is the system described by Wicksell: an economy in which money is created by private institutions in order to provide credit for the working capital requirements of firms, with this money being destroyed upon completion of the productive circuit.

The second element of Woodford's justification for the existence of money demand in his model is an appeal to the fact that the asset issued by the central bank is the *numeraire*: a pure unit of account. This implies that even in the absence of any holdings of this asset, the fact that a given nominal return is available on it will result in this rate of return remaining effective on all riskless assets. The problem with this line of reasoning is that there is nothing in Woodford's system that ensures that central bank liabilities are indeed used as the unit of account. Without a defined demand for money function, there is no reason that an alternative riskless asset shouldn't take the place of the *numeraire* in the system. [6]

Much of the debate around these issues with respect to the new consensus

[6] The framework can be extended to include an explicit demand for money by including real balances in the household utility function to represent the services that holding money provides to households in the form of facilitating transactions. The result of the "LM" relationship that arises from this modification is that the requirement for equality between the rate of interest on money and other riskless asset no longer holds: households will be willing to hold money at a lower rate of return than on equivalent assets, due to the utility yielded. In this case, the rate of interest on non-monetary riskless assets becomes the "money market" rate targeted by the central bank, which can then be achieved through adjustment either of the quantity of money supplied, or through adjustments to the rate of interest on money.

models focuses on two questions: firstly, will the central bank retain control of nominal interest rates in the limiting case of zero holdings of cash or zero reserve requirements? Secondly, does the neglect of the quantity of money in the models matter? (Eg. McCallum, 2001). These questions—and the related technical debates such as whether or not to include real balances in the utility function—miss the more fundamental point that the role of bank money is to generate additional purchasing power where previously it did not exist. Rather than the riskless baseline instrument in a world in which all credit relationships occur directly in perfect financial markets, money bestows upon its holder the ability to spend, regardless of whether a decision to "not-spend" of an equal amount has occurred elsewhere.

Related to this is the point that credit and monetary relationships are persistent. Rather than being able to continuously re-specify contracts in perfect credit markets in response to unexpected shocks, borrowing and lending result in the accumulation of assets and liabilities on the balance sheets of agents. These assets and liabilities set up the requirement for future inward and outward cash-flows—*to be paid in money*. The persistence of these balance sheet structures is of a much deeper order than can be captured through the incorporation of "menu costs" for instance.

The "cashless economy" then, rather than an updated and refined version of Wicksell's pure credit system in which all obligations are settled using bank money, represents a non-monetary system—a Walrasian barter economy in which agents that do not face uncertainty interact directly via perfect credit markets. In simply *assuming* that the nominal terms of the entire structure of financial contracts can be exogenously determined, these models provide little more than a way to examine the reaction of an optimising household when these terms are displaced from their equilibrium state.

2.2.3 Capital markets and the accumulation of capital

Not all of the assumptions described above are maintained across the full spectrum of New Keynesian monetary models—the discovery that rational expectations didn't imply the end of the road for the short-term effectiveness of monetary policy has led to a continual stream of updated and modified versions of these models. All follow essentially the same methodological approach as the canonical models in starting from a baseline RBC system, and introducing frictions into

one or more of the otherwise perfect markets of the model, in addition to the slow adjustment of prices.

For example, the assumption of a representative household implies that the baseline model cannot generate unemployment, but only marginal adjustments to the leisure-labour trade-off of this household. This is addressed by disaggregating the representative households into a continuum of members, and making hiring costly. As a result, deviations from equilibrium result in variations in employment. Whether these costs derive from trade-union power or some other "friction", out of the control of households, the implication is the same: labour market "flexibility" will lead to full employment at the natural rate of output—a concept no different in essence to Friedman's natural rate of unemployment.

A notable contribution of this type was the introduction of imperfections into the capital markets, resulting in the "financial accelerator" model of Bernanke et al. (1999). The results of this model arise from the simple observation that in the presence of imperfect credit markets, the cost of external funds and the opportunity cost of financing investment from internal funds will diverge. This divergence between internal and external funds is referred to as the "external finance premium"—essentially an additional risk premium which reflects factors including "the lender's expected costs of evaluation; monitoring and collection; the 'lemons' premium that results from the fact that borrower inevitably has better information about its prospects than does the lender; and from the costs of distortions in the borrower's behaviour that stem from moral hazard..." (Bernanke & Gertler, 1995, p. 35)

This external finance premium will depend in turn upon the "borrower net worth"—the greater the value of the borrower's balance sheet, the lower is the premium required for external financing. This concept bears a strong similarity to both Kalecki's (1937) principle of increasing risk and to Minksy's ([1975] 2008) "borrower's" and "lender's risk"—this is not noted by Bernanke et al., although Fisher's debt-deflation theory is acknowledged.

In all three systems, the marginal cost of borrowing for investment purposes begins to rise beyond a point determined by the "own capital" of the borrower, defined somewhat differently in each case.

However, the purpose of Kalecki and Minsky's concepts was to place a limit on the level of investment undertaken by firms—since both rejected the standard view of a falling marginal return to capital, some other influence is required in order to determine the demand for new capital assets:

> [I]n an abstract hypothetical world in which the supply of finance is infinitely elastic, in which all prices and yields are independent of the firm's own scale of operation, and into which the realities of risk and uncertainty never intrude... a firm would want to buy an unlimited—nay—infinite amount of capital assets (Minsky, [1975] 2008, p. 107).

For Minsky, the standard New Keynesian assumption of perfect capital markets would thus lead to a limitless demand for capital assets.

The assumption of imperfect capital markets is less fundamental in the case of Bernanke et al.: since the demand for capital is determined by the intersection of the schedules of the expected marginal return and the "cost of funds", demand for investment goods remains determinate even in the case of perfect capital markets. In equilibrium, the "cost of funds" will equal the rate of interest, which in turn is defined by the inter-temporal preferences of the representative consumer. Thus, investment is determined by the saving behaviour of the household.

Once capital market imperfections are introduced, the cost of funds diverges from the rate of interest by an increasing margin beyond the point at which investment is internally financed. As a result, the demand for investment is below the optimal perfect-market equilibrium point.

The key result of such models relates to the fact that the net worth of borrowers does not remain constant with disequilibrium changes in output, but tends to vary in a pro-cyclical way. This is justified by arguing that the strength of borrowers' balance sheets will be affected by changes in the rate of interest in a number of ways: variable rate borrowing and changes in asset prices will affect balance sheets directly, while falling revenues and sticky costs will affect balance sheets indirectly. (Bernanke & Gertler, 1995)

While the dynamics of net worth due to asset price inflation and deflation take a central role in balance-sheet approaches to the firm—as exemplified by Minsky's (1982) financial-fragility hypothesis—these ideas are harder to convincingly incorporate into general equilibrium systems in which "cash-flow" has no meaning at the point of equilibrium, and even in the case of disequilibrium due to rigidities represents only a position in which one or more optimising conditions have not been met.

In the case of Bernanke et al., "entrepreneurial capital" is proxied by the sum of saving in previous periods by firms, which are assumed able to accumulate capital as well as borrowing indirectly from households. Since the price of this

capital is determined by the expected marginal return, changes in output in the presence of sticky prices will affect the relative price of capital and thus the net worth of firms. This in turn will affect the terms on which firms can borrow from households to obtain further capital. This rather circular chain of logic demonstrates the difficulties of incorporating lending and borrowing into a general equilibrium system of representative agents.

In the face of a shock which reduces output below the equilibrium level, the net worth of balance sheets falls and their access to capital decreases accordingly as the external finance premium rises. This reduces the demand for investment, leading to a further contraction of aggregate demand and output.

The introduction of capital market imperfections into the New Keynesian system thus results in an amplification of the disturbances that occur when the system is displaced from equilibrium. The authors claim that this allows the models to more closely track the empirically observed dynamics of output and inflation which result from changes to the nominal interest rate, or "monetary policy innovations" as they are known in the literature.

While the shifts in borrower net worth that occur in these systems are described as "pro-cyclical" (since net worth increases with output), there is in fact nothing cyclical about the behaviour of these models—regardless of whether capital markets are perfect or imperfect. In both Minsky and Kalecki's analysis, the relationship between balance sheet strength and access to capital plays a fundamental role in the endogenous generation of business cycles:

> The upper turning point is completely endogenous once it is accepted that interest rates rise in an investment boom and that the successful functioning of the economy induces profit-seeking bankers and their customers to engage in speculative financial arrangements to economize on holdings of money and protected assets" (Minsky, 1982, p. 33)

In contrast, the New Keynesian models provide an analysis of the path back to equilibrium in the aftermath of an exogenous shock in the form of a "monetary policy innovation", or change in technology or preferences. In the absence of price stickiness and other imperfections, these RBC models would remain continuously in a state of full-employment equilibrium: even when hit by external shocks, relative prices will immediately adjust to the new Pareto-efficient equilibrium. Changes to the nominal rate of interest will have no effect on any variable

other than the price level. In the absence of control over nominal interest rates, the price level will be undefined.

The addition of Calvo-pricing to these models disables the instant-adjustment mechanism. When hit by a shock, not all prices in the system will adapt immediately, resulting in disequilibrium levels of output and consumption. Without further shocks to the system however, these deviations from the long-run steady state will be transitory. The system will always return to the flexible-price natural rate of output. Underlying these models is thus a view that there exists an automatic stabilisation mechanism such that economic systems are continually attracted to their long-run steady state, like a pendulum displaced from its resting point or a spring under tension.

The distinction between the long-run and the short-run is thus clearly defined in the New Consensus models: the short-run is any point when the output-gap is non-zero. The long-run equilibrium position in such models is determined purely by the exogenous parameters of the system: the path taken back to equilibrium, and the length of time until it is reached will depend on the nature and magnitude of the shock, but the destination point will be fully determined.

To this point, the discussion has considered the relationship between capital markets and investment. What has not been discussed is the role of investment and capital accumulation in the context of these models. In this respect, the key point is that these models are constructed in such a way that, despite borrowing for the purposes of investment leading to changes in the stock of capital, no process of long-run growth takes place in these models—the steady state equilibrium is one of constant output.

The role performed by capital in these models is, like labour, to provide an input to a production function in order to generate output. Since both labour and capital exhibit diminishing marginal returns, there will exist some optimal quantity of capital input, given the equilibrium level of output determined by the intertemporal optimisation of the household. In the case of capital market imperfections, the model is set up somewhat artificially such that firms are able to accumulate capital but less than the optimal input quantity in each period, requiring that they borrow in order to rent the remainder from households. In order to prevent firms accumulating enough capital that they become self-financing, firms regularly "die" according to a given probability function, at which point accumulated capital is "consumed" and disappears.[7]

[7] "The assumption of finite horizons for entrepreneurs is... to preclude the possibility that the en-

In the more straightforward case of perfect capital markets, although characterised in various ways in the literature, the investment decision always essentially decomposes to a forward-looking optimisation based on a trade-off between the intertemporal consumption preferences of the representative consumer and the expected marginal return on capital as determined by the technical features of the production function.

Given some exogenous rate of depreciation, along with preferences and technology, in the steady state there will therefore be a constant ratio of consumption to investment and a constant level of output. Investment thus does not result in the accumulation of capital, other than in the sense that out of equilibrium, capital greater than that needed to cover depreciation might be produced, as a result of sticky prices. The natural rate of interest then, rather than a share of the profits generated in a expanding economy, essentially reduces to the "reward for waiting" that would occur in the case of a pure barter system. This was noted by Wicksell in the context of his pure credit economy:

> There is a certain rate of interest on loans which is neutral in respect to commodity prices, and tends neither to raise nor to lower them. This is necessarily the same as the rate of interest which would be determined by supply and demand if no use were made of money and all lending were effected in the form of real capital goods. It comes to much the same thing to describe it as the current value of the *natural rate of interest* (Wicksell, 1936, p. 102).[8]

The significance of this point is that, in the case of a monetary economy, banks are able to offer credit at a rate above or below the level that would be obtained in the case of a pure exchange economy, leading to variations in the general price level. Thus if banks advance credit at a rate below the natural rate, prices will rise at a pace that brings the real rate of interest on money back into equality with

trepreneurial sector will ultimately accumulate enough wealth to be fully self-financing" (Bernanke et al., 1999, p. 1347)

[8]This bears a close resemblance to Keynes' concept of the "own-rate of interest" (1936, p. 223), a concept first elucidated by Piero Sraffa (1932) in his review of Hayek's *Prices and Production*, (1935), the contents of which, he observes, "fully uphold the tradition which modern writers on money are rapidly establishing, that of unintelligibility" (1932, p. 42). He criticises Hayek for his acceptance of Wicksell's identification of the natural rate with the equilibrium rate: "If money did not exist, and loans were made in terms of all sorts of commodities, there would be a single rate which satisfies the conditions of equilibrium, but there might be at any one moment as many 'natural' rates of interest as there are commodities, though they would not be 'equilibrium' rates." (Sraffa, 1932, p. 49)

the natural rate. For Wicksell, it is this power of the banks to create purchasing power without limit at a fixed rate of interest that generates control over the price level—in contrast to Woodford's assumption of control due to agents choosing to hold a marginal quantity of clearing balances.[9]

> From our assumption that every withdrawal of a deposit *must* directly entail the deposit of an equal sum elsewhere or the repayment of an equal loan, it follows that the banks, or rather the aggregate of the banks taken as a whole, can... lend any desired amount of money for any desired period of time at any desired rate of interest, no matter how low, without affecting their solvency, even though their deposits may be falling due all to the time. (Wicksell, 1936, p. 111)

In his description of the pure credit system, Wicksell makes a number of simplifying assumptions for the purposes of the exposition of the model. In doing this, in the view of Hayek (1933), he makes one crucial mistake: he assumes that the economy is in a stationary state. Hayek argues that once this assumption is abandoned and instead an expanding economy is considered, that relative price distortions—in particular the relative prices of capital and consumption goods—must occur. Thus, if the rate of interest is viewed as the relative price of capital and consumption goods, there can be no rate of interest that leads to an increasing stock of capital goods while simultaneously keeping the general price level constant:

> "On the one hand we are told that the *price level remains unaltered when the money rate of interest is the same as the natural rate;* and, on the other that *the production of capital goods is, at the same time, kept within the limits imposed by the supply of real savings.* One need say no more in order to show that there are cases—certainly all cases of an expanding economy, which are the most relevant to trade cycle theory—in which the rate of interest that equilibrates the supply of real savings and the

[9] It is this ability of banks to extend credit without limit that leads Wicksell to his famous analogy between the general level of prices and a cylinder resting on a plane: the point being that there is no predetermined "equilibrium" level at which the general price level should be set. With the application of force to the cylinder (a reduction of the money rate of interest below the natural rate) it can be set in motion, and will continue to move while the force remains present. This is contrasted with relative prices which are akin to a pendulum that always returns to its equilibrium point, since any displacement will result in forces that push the pendulum back to its position of rest.

> demand for capital cannot be the rate of interest that also prevents changes in the price level. (Hayek, 1933, p. 113, emphasis in original)

Similarly to Wicksell, Hayek assumes that credit expands so that initial payments, made by entrepreneurs in receipt of additional liquid loan capital, are made by cheque to other entrepreneurs for capital goods. Even without the assumption of a pure credit system, in such a situation the overall level of deposits in the banking system as a whole will not diminish, allowing for the further extension of credit elsewhere without the reduction of liquid reserves. Hayek argues that only an increase in the rate of interest at which the central bank advances funds to the banking system will be able to bring this process of credit expansion to a to a halt.

In an expanding economy, Hayek argues, falling prices can only be avoided by increasing the money supply. However, this expansion of the money supply will lead to a discrepancy between "the amount of real savings and the volume of investment" (p. 113), which can only be corrected by a rise in the rate of interest.

While Hayek's analysis is faulty, particularly with respect to an economy in which excess capacity exists, the debate touches on a number of points of relevance. Firstly, the potential for the expansion of purchasing power by the banking system to allow for planned saving and investment to diverge. In particular, Hayek is correct that by creating new credit money, the banking system has the power to grant firms the liquidity required for investment to take place without a corresponding decision to save. For Hayek this leads to misallocation of capital, since the diminishing marginal productivity of capital requires that the rate of interest rise as capital is accumulated: with the rate of interest on money set too low, investment is undertaken in projects that do no generate a return sufficient to "induce" an equivalent desired increase in saving.

However, if the assumption of a diminishing marginal return to investment is discarded—as Kalecki argues it should be—then the problem is cast in a different light: what limits investment is not the intersection of the schedules of willingness to "not consume" and discounted expected profits, but access to finance.

This leads to another, more fundamental point: in both the neo-Wicksellian system of the New Keynesian model and the original system of Wicksell, the analysis is rooted in the steady state. The question of how to theorise accumulation in the case of a growing economy is not addressed.

In order to consider the current state of theoretical understanding on growth

and capital accumulation, it is necessary to first take a few steps back. In his discussion of Woodford's model, Laidler (2006) notes that "largely un-discussed problems with capital theory still plague much modern macroeconomics". He is referring to what are known as the Cambridge capital controversies (Harcourt, 1972): the result that when aggregating over production functions with given characteristics, the aggregate function may not inherit these characteristics.[10] Related to this are the problems of representing capital with single index numbers, since quantity and price effects become indistinguishable. This problem was noted by Lindahl, who anticipates the later work of Sraffa in noting that "modern" (ie. marginal productivity of capital) theories of capital "have the disadvantage that the measure of capital is made dependent on the prices of the services invested and on the rate of interest—which belong to the unknown factors of the problem" (Lindahl, 1970, p. 317).

These points are now briefly considered in more detail, before moving on to a discussion of the implications for both modern growth theory, and the New Keynesian monetary models.

2.3 Growth theory

2.3.1 The aggregate production function

The conception of capital as a homogeneous divisible input to a production process represented by a mathematical function has long been a source of controversy. At the heart of this controversy lies the relationship between production, accumulation and the determination the distribution of income, and in particular the distribution of income between wages and profits.

Harcourt & Cohen (2003) present the key tenets of the neo-classical approach in the form of three "parables" (in reference to Samuelson (1962) who referred to the conclusions that arise from the aggregate production function as the "J. B. Clark parables"). These are:

> (1) the real return on capital (the rate of interest) is determined by the technical properties of the diminishing marginal productivity of capital; 2) a greater quantity of capital leads to a lower marginal product

[10] The same result in the case of the utility function is known as the Sonnenschein-Debreu-Mantel theorem (Colander et al., 2008)

> of additional capital... 3) the distribution of income between labourers and capitalists is determined by relative factor scarcities/supplies" (Harcourt & Cohen, 2003, p. 201)

The theory of distribution that is described by these "parables" traces a one-directional line of causation that leads—with given preferences and some exogenous level of technological know-how—from the relative scarcity of factors of production to the distribution of income, such that the owner of each factor of production receives income equal to the additional output generated by that factor of production.

An early acknowledgement of this problem came from Marshall:

> The doctrine that the earnings of a worker tend to be equal to the net product of his work, has by itself no real meaning ; since in order to estimate the net product, we have to take for granted all the expenses of production of the commodity on which he works, other than his own wages. (1920, Book VI, ch. I)

Similarly, he argues, the doctrine that the marginal productivity of capital will tend to equal the rate of interest "cannot be made into a theory of interest, any more than a theory of wages, without reasoning in a circle." (1920, Book VI, ch. I)

Here Marshall touches upon the points that were to take centre stage half century later in the exchanges between Cambridge, England on one side, and Cambridge, Massachusetts on the other. These debate centred on the validity of the neo-classical representation of "capital" as an input to a production function, essentially indistinguishable from either labour or land, and in particular to the implications of using such a production function to represent an economy at the aggregate level.

The use of a continuous, aggregate function, tracing out a smooth relationship between the factor ratio and relative factor incomes implied that "capital" was infinitely divisible, malleable, and substitutable. No limit existed to the level of granularity at which changes of technique could be enacted, with substitution of capital for labour represented as a completely frictionless process, and a process that instantaneously affects not only newly produced capital goods, but also all capital goods currently in operation.

The debates on the production function began when Robinson (1953–1955) resurrected Wicksell's point that heterogeneous capital cannot be measured in a "technical unit". As Wicksell put it:

> Whereas labour and land are measured each in terms of its own technical unit (e.g. working days or months, acre per annum) capital... is reckoned... as a sum of *exchange value*—whether in money or as an average of products. In other words, each particular capital-good is measured by a unit extraneous to itself. However good the practical reasons for this may be, it is a theoretical anomaly which disturbs the correspondence which would otherwise exist between all the factors of production. (1977 [1934], p. 149, emphasis in original)

In her 1953 essay, "The Production Function and the Theory of Capital", Joan Robinson wrote that "the production function has been a powerful tool of miseducation." (1953–1955, p. 81). Robinson observes that a student being instructed in marginalist production theory is first taught that labour is to be measured in man-hours, and then "hurried on to the next question, in the hope that he will forget to ask in what units [capital] is measured. Before he ever does ask, he has become a professor, so sloppy habits of thought are passed on from one generation to the next."

Robinson's point is that any units that may be chosen for the measurement of capital demonstrate serious conceptual problems upon careful examination. Measurement in some physical per-period unit is impossible, at least as soon as more than one type of capital good is included in the analysis: "whilst land can be measured in acres-per-year and labour in man-hours, capital... cannot be measured in terms of physical units" (Kaldor, 1955, p. 90). The alternative is to value capital goods in terms of their rate of exchange with other goods—either as an accumulation of consumption forgone in the past, the result of a "reward for waiting", or through discounting the stream of expected future yields that accrue to the owners of capital assets.

However, in order to value capital as a "reward for waiting", either in terms of goods forgone or against the quantity of labour expended to produce those goods, it is first required that the real wage is known. But, in marginalist theory, the real wage itself depends on the relative factor ratio, which is the unknown of the problem.

Likewise, if an attempt is made to value capital by discounting the future yields obtained through ownership of it, it is necessary to first know the rate of interest at which to discount those yields. But, again, according to the neoclassical theory of distribution, the rate of interest is determined by the marginal

productivity of capital and thus depends on the quantity of capital that enters into the production function.

Joan Robinson's initial contribution (1953–1955) proposes a method to measure "real capital" in terms of labour time. In equilibrium, Robinson argued, since resources remain tied up over the period of production of new goods, the profit obtained on new capital equipment must include a 'premium' to cover the interest forgone while resources are employed in its construction, or equivalently, the supply price of new equipment will include profit at the going rate. Equilibrium can therefore only exist in a situation in which the quantity of capital valued in terms of units of output is constant, and the rate of profit currently prevailing is that which has been in effect over the entire period in which the current capital stock has existed, which in turn must been that rate which was expected over the period of production of those capital goods.

Robinson suggests a method by which the set of all such possible equilibria can be aggregated into a production function: at any given rate of interest, the cost of production of the capital goods required for every different known technique of production is calculated. This cost includes the price of labour time expended over the course of production, compounded at the given rate of interest. Then, rank the set of known techniques according to the rate of output produced with a fixed quantity of labour. Any techniques which incur a higher cost of capital but do not generate a greater level of output than another technique are rejected altogether. By repeating this procedure over all feasible rates of interest, while assuming a fixed volume of labour input, a hierarchy is obtained such that, the technique will be chosen which maximises profits at any given exogenous real wage. At higher real wages, techniques that produce a greater level of output per man, at a greater cost of capital will be chosen.

Thus a relationship between "real capital" per man (the "real factor ratio" and per-capita output can be derived, where "real capital" is the cost of capital goods valued in terms of what Robinson calls the "wage unit": "the price of an hour's labour time in terms of the composite unit of product, no matter whether the worker who performs an hour's work is paid in cash or in peanuts." (p. 86).[11]

The result of all this is that Robinson is able to obtain a measure of capital in terms of pure labour time expended, such that a relationship can be traced

[11] Robinson thus uses a different meaning from that introduced by Keynes in the General Theory, wherein the "wage unit" that was used as the basic unit of analysis was the money wage, rather than the real wage in the case of Robinson.

between capital-valued-as-labour-time, and the rate of (real) output. The shape of the resulting function has little in common, however, with "the smooth sweep of the usual text-book production function" (p. 93), since the jumps in the wage rate that are required to ascend the hierarchy of techniques result in corresponding backward hops in the value of "real capital".

This demonstrates the problem with the procedure proposed by Robinson: the valuation of any given stock of physical capital, and thus the capital-labour ratio, will not take a fixed value, but will be different at different combinations of the real wage and rate of interest. Likewise, two different quantities of physical capital may be valued equivalently at certain wage-profit combinations. Robinson refers to the effects of the rate of interest and the real wage on the value of capital as the "Ricardesque effect" and the "Wicksell effect" respectively.

The "Ricardesque effect" refers to Hayek's (1942) paper on the "Ricardo Effect", in which Hayek argues that firms will always shift to techniques of a lower capital intensity in the event of a fall in the real wage. Any attempt to both increase the degree of mechanisation whilst simultaneously increasing the labour-intensity of production, Hayek argues, will lead only to rises in the price of consumer goods: "The question is rather similar to whether by pouring a liquid fast enough into one side of a vessel we can raise the level at that side above that of the rest to any extent to which we desire" (1942, p. 142).[12]

In opposition to the "Ricardo effect" stands the "Wicksell effect". Wicksell was concerned that the additional output that resulted from a greater capital intensity of production would be partially absorbed by wages (and rent), and thus would not accrue in its entirety as profits. Thus what Wicksell referred to as "Thünens law"—the marginal productivity theory of distribution—could not be applied directly to "capital" at the aggregate level: only for labour and land would the principle hold. (Uhr, 1951)

The meaning of the term "Wicksell effect" has subsequently altered slightly from the sense in which Robinson initially used it, and relates to a phenomenon mentioned by Robinson in her paper, but which was to subsequently take on a greater significance in the capital debates—that of "reswitching". Robinson noted that when constructing the hierarchy of techniques of production, as the notional rate of interest varies, techniques may be rejected on the basis of cost at one rate

[12]Hayek does however recognises the requirement of assuming full employment for such a Ricardian conclusion to hold: "So long as unused reserves of labour are available at an unchanged price, unlimited funds mean unlimited control over resource" (1942, p. 144).

of interest, only to reappear subsequently at another rate of interest. This phenomenon appears because the interaction of the wage rate and the rate of interest in determining the cost of production is non-monotonic with respect to the wage rate. This in turn is due to the way in which the distribution of labour costs over the period of production enters into costs.

Although Joan Robinson noted this as a theoretical possibility, it was with the publication of Piero Sraffa's (1960) *Production of Commodities by Means of Commodities* that the implications of this anomaly for neo-classical theory began to be debated more intensely.

Sraffa's work was an attempt to resurrect Ricardian value theory by constructing a system in which all commodities could be reduced to a dated sequence of labour inputs. As in Robinson's system, labour inputs are compounded at the current rate of profit (interest), such that the effect of a change in the distribution of income on the relative price (value) of a good depends on the way that the labour embodied in that commodity is distributed over the period of production:

> As the rate of profits rises, the value of each of the labour terms is pulled in opposite directions by the rate of profits and by the wage, and it moves up or down as the one or the other prevails... With the rise in the rate of profits, terms divide into two groups: those that correspond to labour done in the more recent past that begin at once to fall in value... and those representing labour more remote in time, which at first rise, ... and then begin the downward movement. (Sraffa, 1960, pp. 35–36)

The result of the indeterminacy of the 'value' of the capital goods required by a given technique of production is that that one technique of production might be used at both a high and low rate of interest, but over an intermediate range between these two points, some other technique would be selected. This "reswitching" of technique has hugely damaging implications for the neoclassical production function and Samuelson's "parables." In Samuelson's own summing up of the debates , he admits that:

> Lower interest rates may bring lower steady-state consumption and lower capital/output ratios, and the transition to such lower interest rates can involve denial of diminishing returns and entail reverse capital deepening in which current consumption is augmented rather

> than sacrificed. There often turns out to be no unambiguous way of characterizing different processes as more "capital-intensive," more "mechanized," more "roundabout," except in the ex post tautological sense of being adopted at a lower interest rate and involving a higher real wage. Such a tautological labeling is shown, in the case of reswitching, to lead to inconsistent ranking between pairs of unchanged technologies, depending upon which interest rate happens to prevail in the market. If all this causes headaches for those nostalgic for the old time parables of neoclassical writing, we must remind ourselves that scholars are not born to live an easy existence. We must respect, and appraise, the facts of life. (Samuelson, 1966, pp. 582-583)

The smooth inverse relationship between the volume of capital in use and the marginal product of that capital claimed by neoclassical authors was shown to be an analytical fiction, at least as soon as one moves beyond the assumption of a single-commodity economy. The corollaries of the neo-classical production function—the well-behaved inverse relationships between the rate of interest on one had and the capital-labour and capital-output ratios on the other—were likewise shown to be incapable of standing up to critical inspection.[13]

2.3.2 Old growth

The most immediate application of the aggregate production function apparatus, which appeared almost contemporaneously with Joan Robinson's initial arguments, was in the model of economic growth introduced by Solow (1956) and Swan (1956), which subsequently came to be known simply as the "neo-classical growth model". This model was represented by Solow as a version of the Harrod-Domar model with a modification of the assumptions about the form of the production function in use. The Harrod-Domar model itself is often presented as an early attempt to provide a dynamic analogue to the statics of Keynes' *General Theory*.

In fact, although Harrod's original formulation of the model is framed around a discussion of a number of concepts elaborated by Keynes, in particular the distinction between *ex-ante* and *ex-post* investment, it is the Keynes of the *Treatise on Money* ([1930] 1971) that Harrod makes direct reference to, not that of the *General*

[13] As more recently demonstrated by Mas-Colell (1989), the relationship between the capital-labour ratio and the rate of interest can take on almost any shape.

Theory. Further, Harrod is quite clear that his model is intended as a conceptual device for consideration of cyclical behaviour: the question he is attempting to answer is not "What are the determinants of economic growth?", but "Why do growing economies diverge from, or oscillate around, trend growth rates?"

To this end he defines the warranted rate of growth as that rate which would occur if *ex-post* investment turned out to be equal to the *ex-ante* level of investment implied by the saving propensity and capital-output ratio. The reasons that investment should diverge from a planned, or "warranted" level in Harrod's model are not clearly spelled out, but it seems obvious that he is not explicitly considering a monetary economy and thus is not referring to "forced saving" of the Hayekian type: "I have no very clear view as to possible causes likely to operate in a systematic way to distort *ex post* from *ex ante* saving, or of the probable importance of such distortions." (Harrod, 1939, p. 20). Nonetheless, he is grappling with the potential for a discrepancy between planned and realised investment to act as the source of a disequilibrium mechanism that results in the instability of the growth path:

> In his Treatise on Money Mr. Keynes formulated a proposition, which has been widely felt to be enlightening, though experience has led him subsequently to condemn the definitions employed as more likely to be misconstrued than helpful. He said that if investment exceeded saving, the system would be stimulated to expand, and conversely. (Harrod, 1939, p. 19)

What has come to be generally taught as the Harrod model is that the rate of growth of an economy is to be found by dividing the saving propensity of the community by the capital-output ratio. However, what Harrod intended to demonstrate with this formulation is the notional growth path of the economy provided that expansionary or contractionary impulses do not arise from such divergences as described above between actual and "warranted" investment. Once such a disequilibrium mechanism is set in motion, Harrod argues that it will become self-reinforcing: if investment is greater than the "warranted" rate of investment, a type of multiplier mechanism will result in an even greater increase in output, since given the assumptions of a fixed capital-output ratio, the actual level of investment will *appear* too low, despite being above the warranted rate, leading to further increases in investment.

While Harrod includes no explicit aggregate production function in his model, the assumption of a constant capital-output ratio leads Solow to conclude that Harrod is using a fixed-proportions aggregate production function. Solow claims that the instability discussed by Harrod is the result of this: the problem arises from the selection of the wrong mathematical form for the production function.

Solow's solution is to use an aggregate Cobb-Douglas production function, with diminishing marginal returns to labour and capital. Then, in per-capita terms, the relationship between of inputs of capital and output of goods assumes the familiar convex shape. With respect to income distribution however, the problem of indeterminacy has been reintroduced since the rate of output varies with the capital-output ratio, and at any given level of output, distribution is "determined" by the marginal productivities of the factors of production

> Once we know the time path of the capital stock and that of the labour force, we can compute from the production function the corresponding time path of real output. The marginal productivity equation determines the time path of the real wage rate... there is a similar marginal productivity equation for capital which determines the real rental per unit of time for the services of the capital stock (Solow, 1956, p. 68).

Overlooking the problems of the inter-dependencies, and indeterminacy, of the variables of the system, Solow finds that the instability of the Harrod model can be eliminated by allowing the capital-labour ratio to adjust so that the fixed proportion of output that is saved—and thus in a non-monetary economy of this type, invested—is just sufficient to keep step with depreciation of the capital stock and the rate of increase of population growth.

In doing so, however, Solow introduces a critical change of assumption: investment is no longer the source of accumulation. The level of investment now only affects the short-term level of output, while in the long-run, the rate of growth is exogenously determined by the growth of the labour force and rate of depreciation. As Harcourt observes, the model "uses a Cobb-Douglas production function and assumes perfect competition, saving determines investment, constant returns to scale and full employment so that the wage of labour equals its marginal product and the rate of profit on capital equals its marginal product" (1972, p. 373). The only remaining element of what could be considered a Keynesian method is the assumption that saving is a constant proportion of output,

rather than being determined by some inter-temporal elasticity of substitution parameter.

The Solow growth model gave rise to two important and, if one accepts the arguments of the Cambridge, England scholars, theoretically flawed concepts: the "Golden Rule" rate of saving, and "Total Factor Productivity". The first of these relates to the idea that, in the aggregate Cobb-Douglas world of the Solow model, the steady-state rate of growth is exogenously given by the rate of population growth. Thus the saving propensity of the community as a whole serves only to affect the composition of output between consumption goods and capital goods, and has no effect on the long-run rate of growth. There thus exists a unique "Golden Rule" rate of saving which maximises the steady-state rate of per-capita consumption, dependent only on the specification of the production function.

The second of these concepts, "Total Factor Productivity", originates with Solow's (1957) description of "an elementary way of segregating variations in output per head due to technical change from those due to changes in the availability of capital per head" (p. 312). Solow presents an empirical procedure that he argues allows for the separation of the effects of changes of factor inputs from changes in factor productivity. This technique has become the standard empirical method for measuring the contribution of technological change to the growth of output.

This is achieved by representing the economy under consideration as a one-sector production function. Then, assuming perfect competition, full employment, and constant returns to scale, by examining the evolution of wages and profits, the labour force and the "size" of the capital stock, the rate of technical change can be empirically estimated as the residual not explained by increases in the inputs to the production function.

This is done by using the functional distribution of income to calculate the elasticity of output with respect to each of the factor inputs: assuming that labour and capital receive their marginal products as compensation, the relative shares of output will reveal the contribution of each to the production of that output. Once these elasticities are known, they can be used to calculate the contribution to output growth over a period of time, by multiplying the elasticity of output by the growth of the factor input. Any residual growth not explained by changes in factor inputs is then attributed to "total factor productivity".

Even overlooking the problems of assuming that the functional distribution

of income is determined by the relative productivity of labour and capital, the serious problems outlined above with the measurement of the capital stock in combination with the assumption of a one-good aggregate production function lead to the potential for highly misleading econometric results. Since capital is usually aggregated at current prices, this makes it impossible to distinguish between changes in the prices of goods and changes in quantities: any increase in the price of capital goods relative to consumption goods will translate into a change in the quantity of capital in the one-good model. In such a case capital would have appeared to have increased without a corresponding increase in output, leading to the false conclusion of negative technical progress: "In short, changes in quantities and prices are treated as if they were purely changes in quantities. It is simply empirical nonsense, as if the changes in the area of a rectangle could be measured by reference to one side." (Fine, 2003, p. 55).

Nonetheless, this method of econometric measurement based on the aggregate production function has become the standard approach to analysis at the aggregate level: "[T]he neoclassical production function is the cornerstone of the theory and is used in virtually all applied aggregate analyses" (Nobel prize-winner Edward C. Prescott 1998, p. 532, quoted in Lavoie 2008a)

2.3.3 New growth

Despite the severe theoretical problems associated with the single-sector aggregate production function which were exposed by the controversies—and admitted by those on the defending side such as Samuelson—a new generation of growth models appeared from around the mid-1980s based on the aggregate production function. Three main features can be identified which define these models and differentiate them from the previous generation of "old" growth models based on the Solow-Swan approach.

The first key feature of these models is that, rather than treating growth as exogenous—determined by saving, as in the Harrod-Domar model, or by population growth as in the Solow-Swan model—the rate of growth is determined endogenously. However, in order for a model based on the neoclassical aggregate production function to be capable of generating increasing per-capita output, the assumption of diminishing marginal productivity of the non-labour inputs to the production function must be dropped: for investment to generate productivity growth, increasing returns to scale are required. The problem with this, how-

ever, lies with the fact that the non-linearities introduced with increasing returns to scale result in serious mathematical problems such as multiple equilibria and instability around the steady state.

The second key feature is that these models, like the New Keynesian models discussed earlier in this chapter, contain some kind of market imperfections. Also in common with the New Keynesian models is the switch from a "static" equilibrium—in which saving is determined exogenously, as in the Harrod Domar model, or as a fixed share of income, as in the Solow models—to a dynamic system in which saving is determined as the result of a forward-looking intertemporal choice problem. The incorporation of market imperfections results in the fact that the level of saving chosen by the representative household does not equal the Pareto-optimal level as determined by the productivity of capital and the intertemporal preferences of the household.

Finally, in order that these models are able to endogenously "produce" productivity change—so that growth rates may be determined by technology, preferences, market imperfections and so on—some additional category of reproducible input is required, such that the production function is no longer confined to simply processing labour and capital. Generally this additional input is characterised as some type of non-physical "capital", such as human capital.

The contributions of Romer (1986) and Lucas (1988) are usually taken as the starting point for the first generation of "endogenous" growth theories. In the Romer model, the level of output is a function of capital, labour, and a new category, human capital. Romer assumes that human capital is produced according to diminishing returns to scale at the firm level, but the production of goods in the economy overall is subject to increasing returns over all three inputs. However, since firms are unable to prevent their competitors from sharing in the benefits of expenditure on human capital formation, an externality exists: firms do not take into account the social benefit of investment in human capital when deciding upon the level of investment. The three key elements of the model—a new type of input, increasing returns to scale and market imperfections—combine to generate a non-Pareto-efficient equilibrium in which investment in human capital is below the optimal level.

The key difference between the new growth theories and the Solow-Swan approach lies in the assumptions regarding the production function. The first generation of "endogenous" models abandon the assumption of diminishing returns to scale for the inputs that can be accumulated. In order that constant returns

to scale are maintained at the the aggregate level, those inputs which do not accumulate (usually labour) must be dropped. Given this assumption of constant returns to scale in the aggregate function, the ratio between physical capital and the 'other' type of capital must remain fixed. Problems of this type can thus be reduced to their essential form, $y = Ak$, such that the growth of output becomes a linear function of the growth of the capital stock. Models of this type are thus referred to as 'AK models'. These models return to the conclusions of the Harrod-Domar model, reinstating the rate of investment as the factor that sets the level of growth, albeit via a more mathematically complex route that is able to endogenise the sources of productivity increases, as a result of market imperfections.

The second generation of new growth models, such as Grossman & Helpman (1991), Romer (1990) and Aghion & Howitt (1992) treat technological change in a different way. In these models, technological change (and thus economic growth) results from the search for innovation by profit-maximising individuals. This innovation process is incorporated into the models by again making alterations to the assumptions regarding the form of the production function. These models drop the assumption of constant returns to scale at the aggregate level, introduce non-reproducible inputs back into the production function, allowing constant returns to the reproducible inputs.

Generally, the non-reproducible input (labour), is then divided into two activities, one directly productive and the other non-productive, but innovation-producing. By altering the amount of labour assigned to each activity, the long-run rate of growth can be affected, endogenising technological progress. Due to market imperfections, the saving rate—determined by inter-temporal utility maximisation—is generally found to be below the Pareto-efficient optimum value, since individuals fail to take into account the existence of growth-inducing externalities.

The models overcome the problem posed to by increasing return to scale—no set of prices will result in general equilibrium—either by allowing constant returns at the firm level but increasing returns at the aggregate level as a result of externalities (often characterised as technical spillover effects, or learning-by-doing), or by abandoning the assumption of perfect competition, and allowing rents to be assigned to activities such as research and development which result in growth-inducing technological change. Thus, as noted by Fine (2000), these models are essentially either a market-imperfections theory of growth, or an attempt to model Schumpeter's view of innovation and 'creative destruction' of

technologies within the neoclassical framework.

In the relatively short space of time since Romer and Lucas published their contributions to growth theory, there has been an immense volume of work published on long term growth theory, partly as a consequence of the increasing availability of data sets against which to test the models. Papers have been published which go beyond human and physical capital, and R&D-type models. Grossman & Helpman (1991) present a model showing the possible effects of trade on growth, while Basu & McLeod (1992) present a model in which the long run rate of growth is altered by terms of trade shocks. Growth theory has thus adopted a changing sequence of justifications for differences in observed growth rates across countries and time-period, with each superseded by the next—partly due to failure to locate convincing empirical support for each supposedly growth-inducing factor. Kenny & Williams summarise the chronology of growth requirements in the literature as "physical capital, human capital, policy reform, institutional reform" (2001, p. 4), and note that sceptics may observe the increasing difficulty of providing the requisite environment for growth in each successive generation of models.

2.4 Conclusion

This chapter has examined the current "state of the art" theoretical literature on monetary economics and economic growth. In addition, a brief historically-rooted discussion of the serious internal flaws inherent in macroeconomic theories based around the aggregate production function is presented.

It is argued that both theoretical systems contain significant deficiencies, over and above the methodological issues common to both. The new consensus monetary approach is based on an essentially non-monetary theoretical framework—that of Walrasian general equilibrium. The introduction of market imperfections does not alter this, but leads to non-optimal equilibria and slow adjustment out of equilibrium. In order to approximate the interest-rate setting behaviour of the central bank, arbitrary assumptions are introduced regarding control of the behaviour of market interest rates. The assumption of agents with the essentially perfect foresight provided by the assumption of rational expectations, operating in complete and perfect financial markets, leaves no space for the analysis of financial structure.

Even putting aside these issues, the focus on a system of monetary regulation

based on a pure interest rate setting regime is unsuited for the analysis of a country such as China in which most interest rates are not determined through market interactions but are fixed by the authorities. In dismissing any role for monetary aggregates, the theory amounts not so much to an endorsement of the post-Keynesian argument that monetary aggregates are determined endogenously, but instead to an argument that monetary aggregates have no economic relevance—a quite different position. In a country such as China in which capital markets are underdeveloped and bank intermediation represents the vast bulk of the financial system, the volume of lending by banks is an economic variable of central importance. The significance of monetary aggregates in the case of China is reinforced by the requirements of dealing with the large inflows of foreign exchange as a result of trade surpluses and intervention in the foreign exchange markets to stabilise the exchange rate.

The theories of growth discussed in this chapter, based around equilibria generated by optimising representative agents, are likewise ill-suited for an analysis of a decades-long investment-led growth boom which has taken place during a period of profound structural change in the context of the transition from central planning. The assumption that income distribution is determined as a result of the relative marginal productivities of factor inputs is shown to be theoretically incoherent, even in the case that the various assumptions required for the results to hold are met. In the case of an economy evolving from a system of central planning in which the state still exerts considerable influence over the behaviour of firms and the banking system, such a theoretical system will generate extremely misleading conclusions. Despite this, these growth models form the basis for much of the empirical work that informs current academic debate on China.

Having examined the current "standard" theoretical approaches to money and growth and found them to be inapplicable to the case of China, the following two chapters develop an approach based on alternative theoretical systems. Chapter 3 examines the interactions of investment, saving and money creation in the context of a true pure credit system using the stock-flow consistent approach of Godley & Lavoie (2007) as the underlying framework. This allows for the analysis of the interaction of financial stocks and flows under various assumptions about the structure of real-sector accumulation in the context of a genuine pure credit monetary system, which is subsequently augmented with other financial features. The analysis of the real sector is pursued further in Chapter 4 based around the theoretical analysis of Steindl and the post-Keynesian Kaleck-

ian growth model. The two systems are integrated into a monetary growth model in the later sections of Chapter 4.

Chapter 3

Stock-flow accounting in a monetary production economy

3.1 Introduction

The concept of stock-flow consistency is most closely associated with the macroeconomic forecasting work of Wynne Godley and his co-authors Francis Cripps and Marc Lavoie. The most recent, and most comprehensive, account of this theoretical system is given in *Monetary Economics*, co-written with Lavoie (2007). This book builds upon the earlier theoretical exposition of the "New Cambridge" approach to macroeconomic modelling that was presented in *Macroeconomics*, co-written by Godley and Cripps (1983)

This approach is founded on the simple assertion that for any formal model to realistically incorporate the representation of specific financial structures, all flows of funds through those financial structures—and the resulting changes in stocks of financial assets and liabilities—should be explicitly accounted for within the model.

As is the case with most non-marginalist approaches to macroeconomic modelling, each sector of the economy (such as households, firms and government) is treated as an economic 'actor' represented by an aggregated balance sheet. Flow-of-funds accounting logic is then used to connect these balance sheets in a way that ensures the internal consistency of the system. Rather than representing the macroeconomic system as a scaled-up analogue to the optimising agents of marginalist microeconomics, stock-flow accounting approaches the macroeconomic system in a top-down manner, dividing the system into a number of

sub-components, and analysing the interaction between these components.

A strong emphasis is placed on the importance of keeping track of the interaction between flow variables and the levels of stocks. The failure of most economic theory to heed to this principle is illustrated by a quote attributed to Kalecki: "I have found out what economics is; it is the science of confusing stocks with flows." (Godley & Lavoie, 2007, p. 1) This consistency between stocks and flows is achieved by the use of a double-entry book-keeping accounting system to connect the flow transactions of the various sectors which make up the economic system.

This system is based on the simple condition that every transaction between agents sets up a flow resulting in equal and opposite changes to the respective balance sheets of those agents. Further, the resulting changes to the balance sheets of transacting sectors must be offset by other changes to the balance sheets of each transacting sector. Thus, any transaction between two sectors will generate flows resulting in a total of four changes to balance sheet stocks.

For example, a purchase by the government of capital goods from the firms sector results in a flow of goods between the two sectors, reducing the stock held by firms while increasing the stock held by the government sector by an equal amount. However, payment for these goods requires that the volume of bank deposits held by the government sector be reduced and those held by the firms sector be increased by an equal amount. This introduces two more balance sheet changes, as well as bringing a third sector into play: the banking system. The government may wish to make up for the reduction in deposits by issuing bonds or levying taxes. Such transactions would then each lead to another four changes to balance sheets across the structure of the model.

In order to track the complete set of such changes within the macroeconomic system, Godley & Lavoie make use of a *transactions flow matrix*. This matrix is the theoretical analogue to the flow-of-funds national accounting system (see Section 6.2), and is generated by the cross-tabulation of all economic sectors (in columns) with an enumeration of all of the different possible transactions types, both physical and financial (in rows). The matrix thus captures the complete set of all possible flow transactions between economic sectors. Only a sub-set of the total implied transactions will be feasible, given the specific institutional structure of the economy. For example, households do not generally have access to central bank deposits. The institutional structure of the economy under consideration may therefore be imposed on the matrix by specifying the set of all permissible

transactions.

This matrix is used to track all chains of flow transactions—such as those described above—across all sectors of the economy. In such a matrix, the macroeconomic condition that all flows must be matched by equivalent flows elsewhere in the system reduces to the condition that all columns and rows of the matrix must sum to zero. Total inflows (outflows) for any sector must be completely offset either by outflows (inflows) or accumulation (emission) of assets (liabilities). Likewise, the total issuance of any type of asset must equal the total holdings of that asset: every financial liability must also be, on the balance sheet of another agent, a financial asset.

This accounting implies in turn that the total stock of all assets and liabilities on the balance sheets of agents must sum to zero, with the exception of physical assets such as capital, land or gold.

The failure to reason in this manner, Godley and Lavoie contend, can result in significant logical errors of analysis. A famous example is the Pigou effect—the claim that, in the face of falling prices and wages, the real value of money balances would rise, leading to lower real interest rates and thus increased consumption and employment. As was pointed out by Kalecki (1944), this assumes that the nominal value of money balances remains constant in the face of falling wages and prices. Further, a large proportion of those money balances will have counterpart liabilities in the form of loans extended to firms by the banking system. As the general level of prices falls, the real value of these debts will rise, potentially offsetting the effect of increased balances on the other side of the balance sheet. Pigou's error thus lies in failing to consider the effect of the liabilities that are the necessary counterpart to financial assets in a modern credit money system.[1]

That the SFC model is watertight in its accounting—and therefore not susceptible to the type of problems just mentioned—is verified by the fact that any system of equations derived from a fully specified set of transactions will always be over-determined: one equation in the system will always be logically implied by all the others. This "quasi-Walrasian" principle gives a simple way to check the stock-flow consistency of any system of equations representing a structure

[1] Another early example is given in Chick's (1992) application of the principles of stock-flow consistency to the IS-LM model. This led to the discovery that the demand function for bonds that is logically implied by the other functions of the model—but had not before been full articulated—contained arguments that did not appear to make economic sense. Chick concluded that she: "learned, gradually, that economics is not about the logical consistency of models—mercifully, as very few models are logically consistent and those which are, are sterile." (Chick, 1992)

of flows. In a credit money system, for example, the equation imposing equality between the supply and demand for deposits will be redundant. In a fully accounted system where every financial asset has a counterpart liability, the demand for the deposits will equal the supply as a logical implication of the sum of the other flows.

This chapter uses the stock-flow accounting framework to demonstrate the interactions between real variables and monetary variables in a stylised "pure credit" economy. This is done through the analysis of a sequence of flow transactions matrices, each a modified version of the previous one. Although the economic system is presented at a highly abstract level, this allows for the illustration of a number of key phenomena at the macroeconomic level, such as the monetary consequences of saving in the firms sector, and the inflation of asset prices due to speculative behaviour. This framework also allows for consideration of the interactions between income distribution, accumulation and monetary variables, topics which are examined more detail in Chapter 4.

Further, as is demonstrated in the empirical analysis in Chapters 6 and 7, such a pure credit system is valid as an approximation of the Chinese financial system. The underdevelopment of domestic capital markets, in conjunction with strong restrictions on outward capital flows, results in banks deposits comprising the vast majority of financial assets. At the same time, the bulk of firms investment is financed either by loans or retained earnings.

Finally, as shown in Chapter 7, while current account surpluses have had a strong effect on the balance sheet of the central bank, sterilisation operations have been largely effective in isolating the domestic financial system from the flows arising from these surpluses. The primary effect of external surpluses thus occurs through the addition to effective demand in the real sector. Section 3.6 illustrates these points by integrating the external sector with the previous analysis.

3.2 Simple "classical" system

The starting point for the analysis will be a simple system in which firms borrow in order to invest in new capital, all saving takes place in the household sector, and the only form of financial assets are bank deposits and loans. This system is shown in Table 3.1

Following (Godley & Lavoie, 2007), the table shows a "transactions flow matrix": a specification of all the potential real and financial flows in the model

economy. This is essentially an abstract representation of the accounts published as the "flow of funds" in many countries. In the matrix, positive values represent sources of funds while negative values represent uses of funds. For each sector, total sources and uses of funds must be equal, implying that columns must sum to zero. Likewise, the constraint that all flows must 'go somewhere' implies that all rows must also sum to zero: all liabilities issued must appear as assets elsewhere in the system, and all spending in the real sector must be matched by expenditure.

The variables used in the matrix are as follows: C, I, and W represent flows of consumption goods, investment goods and wages respectively. Since investment is both a source of expenditures and receipts for the firms sector, the firms sector is divided into a capital account, in which financial transactions and investment expenditure occur and a current account in which all current revenues and expenditures take place. The banking sector is also divided into current and capital accounts, allowing for the profits generated by the spread between lending and interest rates to be recorded as a flow from the current account to the capital account. Interest flows are represented as the product of the rate of interest and the previous-period stock of deposits or loans. Thus the volume of interest paid on deposits in each time period is represented by $r_D \cdot D_{(-1)}$: the rate of interest on deposits multiplied by the stock of deposits outstanding at the end of the previous period. Finally, changes in the issuance and holdings of bank deposits and loans are represented by ΔL and ΔD respectively.

The zero column and row totals that enforce the stock-flow consistency of the system allow one equation to be obtained from each row and column of the system. In the matrix shown above, the rows are trivial and can thus be omitted, giving the follow system of equations.

$$W + r_D \cdot D_{(-1)} = C + \Delta D \tag{3.1}$$

$$C + I = W + r_L \cdot L_{(-1)} \tag{3.2}$$

$$I = \Delta L \tag{3.3}$$

$$\Delta D + r_L \cdot L_{(-1)} = \Delta L + r_D \cdot D_{(-1)} \tag{3.4}$$

As previously noted, any set of equations derived from a stock-flow consistent taxonomy will be over-determined: any one equation in the system is implied by the other three. While this system cannot be solved without dropping one

	Households	Firms (cur)	Firms (cap)	Banks (cur)	Banks (cap)	Total
Consumption	$-C$	$+C$				0
Investment		$+I$	$-I$			0
GDP		$[Y]$				
Wages	$+W$	$-W$				0
Deposit interest	$+r_D \cdot D_{(-1)}$			$-r_D \cdot D_{(-1)}$		0
Loan interest		$-r_L \cdot L_{(-1)}$		$+r_L \cdot L_{(-1)}$		0
Net fin. balance	$[S_H]$	$[0]$	$[-I]$	$[0]$	$[0]$	0
Chge in Deposits	$-\Delta D_H$				$+\Delta D_b$	0
Chge in Loans			$+\Delta L$		$-\Delta L_b$	0
Total	0	0	0	0	0	0

Table 3.1 – "Classical" case: investment funded by bank loans

equation, which equation is dropped will make no difference to the logic of the system.

This system bears at least a passing resemblance to a classical system of perfect competition: firms do not make any profits so all revenue is returned to households in the form of wages or interest payments. The system differs from a classical model, however, in the fact that no restrictions are imposed on the division of household income between these two flows. In particular, there is no requirement that the marginal productivities of factors of production determine the distribution of household incomes between interest and wage incomes.[2]

The assumption of zero profits means that firms have only one option for the financing of investment: to increase their financial liabilities by obtaining fresh bank loans. In any period, the total spent on investment will exactly equal the net volume of new loans extended by the banking system, thus the total outstanding stock of bank loans will at any point in time equal the total spent on investment up until that point in time.

In the case of banks, this assumption requires that lending and deposit rates must be equal and therefore—if we put aside the possibility of non-performing loans for the time being—that the total volume of loans outstanding must, at any given point in time, equal the total volume of deposits held by households. The volume of deposits will, in the absence of bank profits, therefore also be equal to the total amount spent on investment up until that point.

If the system were constrained to operate according to marginalist principles, in any given period banks would lend to firms up until the point at which the expected returns on new investment were equal to the rate of interest on loans. This rate of interest would also be that which was just enough to bring forth the quantity of additional deposits needed to finance this additional investment. This is the standard neo-classical view in which "deposits finance loans" or, equivalently, "saving finances investment".

The alternative view is that in which bank lending leads deposits. This version originates with Hartley Withers (1920), and is subsequently found in Kalecki ([1933] 1990) and Keynes (1937a), Hayek (1933) and Schumpeter ([1938] 2008). In this view, economic expansion is lead by the decisions of banks and firms. Banks extend loans to the firms sector, simultaneously increasing the volume of

[2]The system is also has a similarity to Wicksell's (1936) "Pure Credit Economy", although in Wicksell's system the finance for investment is provided not by surpluses in the household sector but by "capitalists". This finance is lent via the banking system to a distinct class of "entrepreneurs" who use these borrowed funds to finance investment in working capital

deposits held by firms. These additional deposits are used to purchase capital goods from other firms. The receipts of the firms sector increase as a result of these additional expenditures and, in the current model, must therefore accrue to households as additional wage payments. Since households have only two possible uses of funds—consumption, or saving in the form of deposits—any increase in wages due to increased investment spending must accumulate as deposits: if the additional money-flows were directed to consumption, this would increase firms receipts further, resulting in yet higher wages and so on.

Any successful decision to undertake investment by firms will thus result in an increase in the volume of deposits held by households as the financial counterpart to real saving, as well as expanding the banks' balance sheet. This will then give rise to increased claims on future output in the form of deposit interest. If the investment undertaken increases output, this will be realised through these interest payments as well as potentially lower prices or higher wages. Conversely, if investment is unsuccessful, households will have claims on output in the form of interest payments that firms are unable to meet unless wages are lowered or prices increased.

The preceding discussion highlights some of the potential pitfalls of reasoning in terms of systems of money-flows. All of the equations that can be derived from the matrix are *ex-post* identities. One must be extremely careful about the hazards of introducing implicit assumptions about causation into any conclusions drawn about the workings of the system. For example, the previous discussion demonstrated that, with all other entries in the matrix held constant and assuming zero banking profits, in order that spending on investment takes place, an equivalent increase in the volumes of loans and deposits in the system must also occur. This is a very different proposition to the statement that firms are able to automatically increase the level of investment, and therefore output, as long as they are able to gain access to bank loans. Those firms that attempt to undertake such investment may be unable to induce other firms to undertake production of capital goods due to insufficient physical capacity, or inability to find the additional available labour required to expand employment. Households as a whole may be willing to offer this additional labour, but only in return for increased consumption, not increased savings. The identities of the matrix are equally compatible with the reverse causation: because an increase in the volume of household deposits requires investment expenditures to take place, the system could be read as showing that higher household saving will result in higher investment. This of course is the

view that was refuted by Keynes in his 'paradox of thrift'.

The key point is that the intentions of units at the micro level do not necessarily translate into the equivalent inter-sectoral flows at the macro level. The transactions matrix can only illustrate at the macro level the various potential logical outcomes of the flow system, regardless of whether these outcomes are compatible with the intentions and expectations of the agents that give rise to them.

Before introducing the first modification to the matrix, the implications of dropping the assumption of zero bank profits is analysed. If a margin between lending and deposit rates is introduced, while retaining the assumption that the banking system operates with no costs such as wages, the only option is for the rate of accumulation of loans and deposits to diverge by an equal rate. Thus, if the rate of interest set on loans is above that set on deposits, the volume of loans outstanding will expand faster than the volume of deposits. The net worth of the banking system will thus increase—assets expand faster than liabilities. A process of this sort will result in households "owning" less than the total capital stock, as the volume of deposits held by households will be less than the total spent on investment. A large spread between deposit and lending rates could also be used as a strategy by the banking system in an attempt to avoid crisis if firms are unable to meet their interest payments and consequently default on their loans—leaving banks with liabilities they cannot meet in the form of deposit interest.

3.3 Profits in the firm sector

If the assumption that the profits of the firm sector are zero is now dropped, as shown in Table 3.2, the possibility is introduced for firms to retain as profits some share of their revenues, rather than returning the entire flow to households in the form of wages and interest payments.[3] This reduces the firm sector's reliance on bank loans to finance investment. By using earnings to finance investment, firms are able to 'short-circuit' the banking system thus avoiding the need to pay interest on loans taken out to finance investment.

The only way that firms can "directly" divert a portion of current income to

[3]The assumption that banks make zero profit has been reintroduced, allowing for the simplification of the matrix by removing the distinction between the current and capital accounts of the banking system.

investment—rather than this occurring via the banking system—is for outgoings to be reduced relative to receipts. In the current configuration of the model this requires either a reduction in wages or interest payments relative to total income. Viewed in marginalist terms, this would imply the departure of the model from the world of perfect competition, allowing for a mark-up between costs and prices due to monopoly power.

In the previous matrix, the possibility of "forced saving" existed through banks extending loans to firms. Investment could thus take place and would result in deposits accruing to households as the counterpart to loan-financed investment. With the possibility of a mark-up on prices over costs, firm's profits become another mechanism by which savings can be "forced" into the system, with the advantage to firms that this will take place without all of the new saving resulting in new liabilities on their balance sheets. In the extreme case, in which all new investment is financed out of profits, all investment results in an increase in net worth for the firm sector with no increase in liabilities.

The difference between this case and the previous one in which all new investment is financed through bank lending occurs purely in the financial sector: exactly same level of consumption and increase in the capital stock could take place in each of the two scenarios. Adjustments of the price of consumption goods relative to wages thus allow for a range of financial sector outcomes that are compatible with a single set of real-sector outcomes.

With the introduction of retained profits into the system, the opposite extreme to the previous case in which all saving occurred in the household sector may be analysed. This is the system in which households consume their entire wage income while firms re-invest all profits. In such a system, Kregel argues, the rate of accumulation will be determined by the mark-up on the costs of production. The mark-up will determine the level of profits, which if entirely invested will determine the rate of growth.

> If firms invest all profits and employ labour that spends all its income, the rate of growth depends on the distribution of income as determined by the Kaleckian degree of monopoly. (Kregel, 1989-1990, p. 232)

In this system, the real expenditure of each sector exactly matches the level of income, with the result that no inter-sectoral financial flows will occur. For this

	Households	Firms (cur)	Firms (cap)	Banks	Total
Consumption	$-C$	$+C$			0
Investment		$+I$	$-I$		0
GDP		$[Y]$			
Wages	$+W$	$-W$			0
Profits		$-S_F$	$+S_F$		0
Deposit interest	$+r_D \cdot D_{(-1)}$			$-r_D \cdot D_{(-1)}$	0
Loan interest		$-r_L \cdot L_{(-1)}$		$+r_L \cdot L_{(-1)}$	0
Net fin. balance	$[S_H]$	$[0]$	$[S_F - I]$	$[0]$	
Change in Deposits	$-\Delta D_H$			$+\Delta D_b$	0
Change in Loans			$+\Delta L$	$-\Delta L_b$	0
Total	0	0	0	0	0

Table 3.2 – Retained earnings

reason, an economic system of this type is referred to by Kahn as a "non-monetary economy" (quoted in Kregel, 1989-1990, p. 232).

In the intermediate case in which households save some proportion of their income, saving will be distributed between the deposits of households and firms in proportion to the mark-up. The share of saving that accrues as profits can be obtained by extracting the *net financial balance* row from the matrix, and rearranging to give the following identity:

$$S_F = I - S_H \tag{3.5}$$

This identity is the well-known Kalecki-Steindl profit reflux equation. While Kalecki tended to assume that households did not save out of wage income, Steindl (1952), emphasised the effect of saving out of the relatively protected income of the middle classes. As the saving of the household sector increases, the saving of firms is reduced by an equivalent amount. The increases in the "gearing ratio" that arise with the increased saving of households then sets up interest liabilities for the firms sector which accrues as the earnings on deposits for households.

Conversely, and since firms are assumed not to hold financial assets, a shift in the mark-up in favour of firms allows for the possibility of paying off some portion of the loans used to finance investment. Thus, as profits increase or, equivalently, household saving decreases, investment may come to "finance itself".

Without the inclusion of a government or external sector in the model, the worst possible position for the firm sector is to exactly break even on current account: as in the previous model, the difference between wage income and consumption expenditure will exactly equal firms' borrowings for investment, so $S_F = 0$ and $S_H = I$. By expanding the model to include a government sector and external sector, the full Kalecki-Steindl equation[4] could be incorporated into the analysis, such that government surpluses or trade deficits may push the firms sectors into negative saving: firms would then be required to borrow to cover current expenditures as well as investment.

Inclusion of these sectors would result in the possibility of the firm sector being forced into an operating at a loss in the case the government surplus and trade deficit combine with household saving to exceed investment.

[4]With the inclusion of the government and foreign sectors, the profits of firms are reduced not only by the saving of households, but also by the surplus of the government sector and the trade deficit: $S_F = I - S_H + (G - T) + (X - M)$

	Households	Firms (cur)	Firms (cap)	Banks	Total
Consumption	$-C$	$+C$			0
Investment		$+I$	$-I$		0
GDP		$[Y]$			
Wages	$+W$	$-W$			0
Profits		$-S_F$	$+S_F$		0
Deposit interest	$+r_D \cdot D_{H(-1)}$	$+r_D \cdot D_{F(-1)}$		$-r_D \cdot D_{(-1)}$	0
Loan interest		$-r_L \cdot L_{(-1)}$		$+r_L \cdot L_{(-1)}$	0
Net fin. balance	$[S_H]$	$[0]$	$[S_F - I]$	$[0]$	
Change in Deposits	$-\Delta D_H$		$-\Delta D_F$	$+\Delta D_b$	0
Change in Loans			$+\Delta L$	$-\Delta L_b$	0
Total	0	0	0	0	0

Table 3.3 – Overcapitalisation

3.4 Excess capital

The next modification introduced to the flow model allows for the holding of bank deposits by firms. With this change comes a much broader range of possible ways in which the configuration of assets and liabilities in the system can evolve. By introducing the possibility that firms may choose to hold financial assets rather than engage in productive investment, the potential for over-capitalisation of the firm sector arises.

Over-capitalisation refers to the "holding of financial liabilities in excess of those needed to undertake production" (Toporowski, 2008a). This possibility is excluded in the previous stages of the model in which the only uses of funds available to firms are the payment of wages and interest and investment in capital goods. This changes once firms have the opportunity to accumulate funds in the form of bank deposits: as long as a firm has both financial assets and liabilities on its balance sheet it is, by the above definition, holding excess capital.

What are the implications of the holdings of excess capital by firms? This depends in part on the way in which this capital is accumulated.

> [I]t may be supposed that since saving equals investment, it is not possible for firms to hold excess capital, except as net debt issued by either households, the government, or the foreign sector. This is true if it is assumed that all production is, and has only ever been, undertaken by capitalistic firms. (Toporowski, 2008a, p. 8)

In this view, the only sector that could issue this net debt is the household sector. Thus, as a consequence of the household sector consuming in excess of its income, it would emit liabilities that would accumulate as financial assets held by the firms sector. The problem with this is that, in order for the firms sector to have become over-capitalised, it must have previously issued financial liabilities in order to access the funds to purchase these financial assets. Where then will the counterpart assets to these financial liabilities be held? If these assets are held by households, these then would then offset household liabilities resulting in a neutral net financial position, rather than a position of net issuance of debt.

There is another alternative suggested by the current configuration of the model. The possibility of the household sector being in a negative net financial position is excluded by the assumption that households are unable to issue any financial liabilities. However, the firms sector as a whole may hold excess capital

simply by accumulating both loans and deposits on its balance sheet.

This can be illustrated using the "non-monetary" case above in which households spend the entirety of wage income on consumption. Any credit-financed increases in investment expenditure by firms will thus lead to an accumulation of deposits in the firms sector equal to the increase in loans. If firms, instead of choosing to pay off these loans, choose to hold the additional deposits, a situation of overcapitalisation can arise without the net issuance of liabilities by any other sector.

This case may be compared to the opposite extreme in which all saving accrued in the form of households' deposits: in that case, the final configuration of deposits and liabilities represents net lending from the household sector to the firm sector. The investment undertaken by firms must thus generate increased output in future periods of an amount great enough to cover the interest liabilities resulting from this lending. In the case of 'over-capitalisation', there has been no inter-sectoral net lending: the increase in deposits held by the firm sector is equal to the increase in loans it holds. Thus, the cost of borrowing to the firm sector as a whole is in this case proportional to the margin between the loan and deposit rates of interest, rather than the absolute value of the loan rate of interest, as is usually assumed in discussion of the effect on investment of changes in the rate of interest. (Toporowski, 2010). The per-period cost of additional excess capital financed from bank lending is thus equal to the following:

$$\Delta L(r_L - r_D)$$

Toporowski describes the situation in which investment continues to be financed as in this way, with further investment in subsequent periods also financed out of bank lending:

> What happens if firms finance their investment entirely through debt? After a number of years, firms will end up with a stock of debt that is exactly equal to the sum of their expenditures on capital formation over those years. In addition... all firms will have deposited into their banks retained profits exactly equal to the amount that the firms have spent on capital formation. The banking system will have deposit liabilities to firms that exactly equal to the amount that the banks have advanced to firms to pay for that capital formation. The firm sector as a whole will have debts equal to the capital equipment that has been

> purchased over the years. But those debts will be exactly hedged (for the capitalist firms as a whole) by cash deposits in the banking system. If the financing structure of all firms corresponds to some representative 'average' firms, then the financing of every firm will be perfectly hedged with bank deposits." (2010, pp. 2–3)

Thus, once firms have undertaken investment financed in the way shown in Table 3.3, at the start of the subsequent period the firm sector will be holding deposits equal to the total expenditure in the current period. Firms thus only need to expand the liability side of their balance sheet in subsequent periods if they wish to undertake investment expenditures of an amount greater than their accumulated spending—or if they wish to increase their level of excess capital holdings. If firms continue to invest an amount equal to the deposits held, with these deposits returning to the firms sector each period, these deposit holdings come to play the role of Keynes' "revolving fund of finance" (Keynes, 1937a, p. 247).

In either the case of complete over-capitalisation in which firms end up with a stock of debt and deposits matched by the total spent on investment, or the case of 'marginal' over-capitalisation in which which the stock of debt is incrementally increased as desired investment exceeds the stock of retained profits, the rate of interest—and thus the balance sheet of the firms sector—behaves in a way quite different to that of standard marginalist theory. As previously noted, it is the *margin* between the lending and deposit rates faced by firms that represents the cost of over-capitalisation—and in this example, real investment.[5] Thus, the standard view of the relationship between the investment decisions of firms and the conduct of interest-rate policy by the central bank—higher bank rate will, *ceteris paribus*, induce lower investment—may not hold unless a higher bank rate causes a wider spread between lending and deposit rates.[6] Similarly, if the central bank were to operate in such a way as to attempt to restrict the availability of loans through quantitative measures, textbook theory would argue that reduced availability of credit and the associated interest rate rises should ensure that only more

[5]We have assumed zero profits in the banking system for the sake of simplicity, which rules out a spread between lending and deposit rates. However, if we were to instead assume that all banking sector profits are returned to households, the difference between investment that results in households holding deposits, and investment that results in firms holding deposits is clear: in the former, the cost to firms of investment is $I \cdot r_L$, whereas in the latter case it is $I \cdot (r_L - r_D)$

[6]The current model would need to be extended to include a central bank as a separate sector in order to consider the implementation of monetary policy in detail.

potentially profitable investments would be undertaken. However, if the spread between lending and deposit rates does not widen, the cost of investment will not rise. The distribution of credit among firms may in this case be determined by factors other than expected returns on investment.

It is at this point that some limitations of the accounting identities come into focus. Firstly, just from inspection of the transactions matrix, there does not appear to be any direct connection between real investment and the financial assets and liabilities of the firm sector. Given any initial set of valid values for the matrix, spending on investment can be increased by any amount—without violating any of the identities implied by the matrix—as long as profits are increased by the same amount. However, we know that an increase in investment cannot take place without a prior expansion of lending by banks to the firm sector—even if all of this additional spending remains within the firm sector as retained profits. It is of course possible that firms will borrow from banks to undertake investment, and then in the same period use the retained earnings to repay the bank loans, thus resulting in a set of net transactions that show only an increase in profits and investment.

A second issue, and one that that is returned to later, is the problem of the level of disaggregation in the model. By examining the money-flows through a number of sectors of the economy, the dynamics of changes within each of those sectors is obscured from view. There are several ways in which this could mask important economic behaviour. One possibility relates to variations in the financing structure of businesses within the firm sector: although in the over-capitalisation case it appears that the firm sector as a whole is fully hedged against its liabilities as deposits circulate within the sector as a whole and do not "leak" out into the hands of households, it is possible for a redistribution of assets and liabilities to take place *within* the sector.

For example, it is possible that larger firms are more profitable than smaller firms, due to their ability to engage in monopoly pricing. This would result in smaller firms requiring a higher level of loan finance to undertake investment, while large firms are able to invest using retained earnings. In this case of "maldistribution of profits", some part of the deposits that are the counterpart to the loans used to finance investment end up not on the balance sheets of the small firms that took out the loans, but on those of the larger monopolist firms (Steindl, 1952). This could be incorporated into the analysis by splitting the firm sector into large and small firms. However, the intra-sectoral flow dynamics may be more

subtle than can be captured by a simple two-way division: there may a distribution of financing structures across firm sizes, or different financing structures depending on the industry type.

3.5 Equity issuance

The final development to be analysed is the inclusion of equities as an asset class. In most models, equity issuance is seen as an alternative way for firms to obtain access to the savings of other sectors—primarily households— for use as investment funds. These transactions are often channelled via institutional intermediaries such as pension funds. The issuance of equity allows for the expansion of investment without the concomitant expansion of debt liabilities.

Recent literature on firms' behaviour in relation to equity issuance tends to focus on issues of "shareholder value". This literature focuses on the pressure placed on firms by shareholders to expand dividend payouts at the expense of real investment. Models are constructed which examine the effects on growth of the way in which firms allocate earnings between real investment and dividend pay-outs, with increasing shareholder power resulting in a focus on short-term profits at the expense of longer-term investment.[7]

Another approach is found in the work of Toporowski (2000) in which it is argued that, rather than issuing equity for the purposes of financing new investment in real assets, those firms that have access to the capital markets use them to maintain internal liquidity by raising cash against previous investment projects. Equity issuance is thus used as a mechanism to maintain a state of overcapitalisation following the depletion of internal funds by spending on investment projects. Furthermore, when faced with a situation of rising prices in the equities markets, it may become profitable for overcapitalised firms to allocate excess capital to financial assets in preference to engaging in real investment.

Table 3.4 shows the transactions matrix used in the previous examples, modified to include a new class of financial assets in the form of equities. The number of equities issued is represented by e, the price is represented by p, and the dividend pay-out per-share by d. Two additional financial flows are thus shown in the transactions matrix: the change in equity holdings by the household sector, and the dividend pay-out based on holdings in the previous period.

[7] Eg. Hein (2008), van Treeck (2008), Stockhammer (2004).

	Households	Firms (cur)	Firms (cap)	Banks	Total
Consumption	$-C$	$+C$			0
Investment		$+I$	$-I$		0
GDP		$[Y]$			
Wages	$+W$	$-W$			0
Profits		$-S_F$	$+S_F$		0
Deposit interest	$+r_D \cdot D_{H(-1)}$	$+r_D \cdot D_{F(-1)}$		$-r_D \cdot D_{(-1)}$	0
Loan interest		$-r_L \cdot L_{(-1)}$		$+r_L \cdot L_{(-1)}$	0
Dividend payments	$+d \cdot e_{h(-1)}$	$-d \cdot e_{h(-1)}$			0
Net fin. balance	$[S_H]$	$[0]$	$[S_F - I]$	$[0]$	
Change in Deposits	$-\Delta D_H$		$-\Delta D_F$	$+\Delta D_b$	0
Change in Loans			$+\Delta L$	$-\Delta L_b$	0
Change in Equity issuance	$-\Delta e_h \cdot p_e$		$+\Delta e_h \cdot p_e$		0
Total	0	0	0	0	0

Table 3.4 – Speculative overcapitalisation

It was argued in the previous section that the cost to the firm sector of holding liquidity in the form of deposits depends on the profit margins of firms, or equivalently the level of household saving: if firms do not turn a profit then any liquidity held by the firm sector must be borrowed from the banking sector, with the margin between deposit and lending rates as the cost of this liquidity. That this liquidity is effectively "borrowed" from the household sector: both the loans and deposits that are created with new bank lending appear on the balance sheets of firms. If these liquid reserves are then depleted by investment in real assets, the firm sector is then required to issue further liabilities in order to regain the previous level of liquidity.

Once firms gain access to the capital markets, the issuance of equity provides an alternative to debt as a way of maintaining a state of overcapitalisation. By issuing fresh equity, firms can replenish their stocks of liquidity using the returns on previous investment to fund the dividend payments.

The introduction of equities as an asset class also allows for the consideration of capital gains, something that presents problems in the context of a flow-of-funds analysis, as the prices of equities can change without resulting in any inter-sectoral flows.

Broadly speaking, there are two reasons why the prices of equities would change in the absence of any new issuance of shares. The first is the appearance of some new piece of information on the prospective returns from real investment. If there is a rise in the expected level of dividend payments, money-flows will occur as a result of funds being reallocated between bank deposits and securities in the portfolios of households.

The second possibility arises from to the fact that, once a rise in the prices of shares has taken place, the expectation of further rises in share prices and thus the prospect of capital gains for the owners of equity may cause further inflows into these assets. In turn, this inflow of funds causes prices to rise, validating the judgement of those astute enough to have seen them coming.

As always, in a closed flow-of-funds system, a flow into a class of assets cannot happen in isolation: all flows must originate somewhere. If all equity is initially held by households, how can household buying of equity in response to some exogenous event cause a rise in share prices? Again the problem of aggregation in macroeconomic models shows itself: what is required is that some sub-division of the household sector is willing to purchase equities at a higher price than was paid by the current holders of equity. There is thus a redistri-

bution of the ownership of equity within the household sector, accompanied by a rise in the prices of shares. There must also be a corresponding intra-sectoral flow in the opposite direction representing the payment for the newly purchased shares. This is likely to take the form of a redistribution of bank deposits to offset the change in equity holdings.

If it is assumed that all purchases of equity in the secondary markets by households are undertaken using bank deposits as payment, there is thus a limit to the extent to which price inflation in the capital markets can take place, set by the total stock of deposits in the household system: eventually the distribution of equities and deposits within the household sector will take on a configuration such that no further redistribution and price rises are possible, without further deposits becoming available to the household sector to use as means of payment. If the household sector turns to bank borrowing to enable continued purchases, a classic credit-funded equity bubble will ensue.

We may also consider the situation wherein newly issued equities are purchased by other firms within the corporate sector: in this situation there will be a reallocation of deposits *within* the firm sector and an increase in both the holding and issuance of equities within the sector. However, none of these changes will result in an inter-sectoral flow-of-funds, and thus entries on the transaction matrix. Changes in the relative paper wealth of the household and firm sectors are thus possible without any entry on the flow of funds matrix, in both the case of a redistribution of equities within the household sector and the firm sector. The only changes that will be visible in the current schema are those involving a change in the total holdings of equities by households

What are the consequences of the holding of equities by the firm sector? In a setting of rising prices in equity markets, overcapitalised firms face a trade-off in how to allocate excess capital between real investment, deposits and equities: it is possible that the expected capital gains on equities will be great enough to offset the cost of overcapitalisation. The conditions under which this will be the case depends initially on the historical profitability of firms, ie. to what extent the financial assets corresponding to previous investment have accrued on the balance sheets of households or firms, and upon whether equity was initially purchased by households or firms. We can examine each combination of cases in turn.

Consider first the case wherein firms collectively have made no profit, so the deposits that correspond to real saving and investment are all held in the house-

	Households	Firms	Bank
Physical Capital		$+K$	
Deposits	$+D$		$-D$
Loans		$-L$	$+L$
Equities		$-e \cdot p$	
		$+e \cdot p$	
Total (Net Worth)	D	$K - L$	

Table 3.5 – Sectoral balance sheet: saving in household sector, equity initially bought by households

hold sector, so $S_H = I = D_H = L$. As argued before, the cost to firms of overcapitalisation in the form of holding deposits will be the margin between lending and deposit rates, since any deposits held by the firm sector will have to be obtained through bank lending. If firms now begin to issue equity as a way of raising further capital, these equities may purchased either by households, or by other firms.

Again the two 'edge cases' are of interest: if all equity is bought by households, the result is a flow of deposits from households to firms as payment. Firms are thus able to increase the liquidity of their balance sheets without recourse to further bank lending. The cost of this excess capital is now the margin between the dividends paid out on the equity held by households, and the rate of interest paid on the deposits of firms. Now consider a further development whereby at some subsequent point, in response to a rise in equity prices, firms choose to purchase stocks on the assumption that they will make capital gains. If all equity is bought back from the household sector the balance sheets of all sectors are identical to how they were before equity was issued, except that some subset of the firm sector now holds the equity of some other subset of the firm sector. The cost to the firm sector of this form of overcapitalisation is nil at the aggregate level: all dividends paid out remain within the firm sector. The final balance sheet position of each of the three sectors in this case is shown in Table 3.5.

Alternatively, as equity is initially issued, firms may purchase it directly from each other. In the case under discussion where all deposits are held by households as the counterpart to loan-funded investment, firms will only be able to purchase equities by obtaining fresh liquidity in the form of further loans from the banking system. The deposits created as the counterpart to these loans will remain within the firm sector, as firms purchase shares from one another. Not all firms will necessarily increase their liabilities: some firms may only issue fresh equity, as a way

	Households	Firms	Bank
Physical Capital		$+K$	
Deposits	$+D$	$+D$	$-D*$
Loans		$-L*$	$+L*$
Equities		$-e \cdot p$	
		$+e \cdot p$	
Total (Net Worth)	D	$K - L$	0

Table 3.6 – Sectoral balance sheet: saving in household sector, equity initially bought by firms

	Households	Firms	Bank
Physical Capital		$+K$	
Deposits		$+D$	$-D$
Loans		$-L$	$+L$
Equities		$-e \cdot p$	
		$+e \cdot p$	
Total (Net Worth)	0	K	0

Table 3.7 – Sectoral balance sheet: saving in firm sector, equity initially bought by firms

of increasing liquidity or paying back previous loans, while some take on fresh debt as a means to holding equities. Some firms may both issue new equity and purchase stocks, meaning they are able to hold equities without incurring further debt. The total level of debt in the firm sector will thus depend upon the extent to which firms that issue new equity choose to use newly available liquidity to pay off loans. In the case that no loans are paid off, there will have been an increase in both loans and deposits in the firm sector by exactly the amount that was raised by issuing equity. The cost to the firm sector as a whole of this new asset and liability structure will thus be the amount raised by equity issuance multiplied by the margin between deposit and lending rates, $e \cdot p \cdot (r_L - r_D)$. The final sectoral balance sheets for this case are shown in Table 3.6. In this balance sheet, those magnitudes greater than the total amount spent on real investment are marked with an asterisk: for example, the volume of loans outstanding is greater than the amount spent on real investment in this case, as firms have used loans both to finance real investment and to purchase equities.

Now consider the final case in which the financial saving that is the counterpart to real investment has accrued to firms as profits, and the household sector holds no financial assets. In this case, if firms begin to issue equity, it is not possible for the household sector to purchase the shares as they hold no savings. Thus

the only possibility is for firms to buy the stock of other firms. As this takes place, there is once again no inter-sectoral flow of funds as the deposits used by firms to buy stock are transferred to other firms. The additional costs to the firm sector as a whole in holding additional capital in the form of equities is thus once again zero in this case. The balance sheets for this case are shown in Table 3.7.

There are thus three potential 'edge case' configurations of firm overcapitalisation through the ownership of equity: two that originate with the situation in which real investment was originally financed by a sectoral surplus in the household sector, and one in which retained earnings allowed firms to invest without incurring any net financial liabilities. The balance sheets of these three possible cases are shown in Tables 3.5-3.7. In each of the three cases, the combination of the net worth of each sector, and the cost to the firm sector of holding excess capital in the form of equity is different.

3.6 Foreign trade

The analysis to this point has assumed a closed economy. The case of an economy with international trade is now examined. The example used will be tailored towards the specific case of China. This will demonstrate that the presence of a significant surplus on current account, in conjunction with the operations undertaken by the central bank in the foreign exchange markets do not materially alter the validity of the above analysis.

Table 3.8 shows the modifications required to incorporate the foreign sector into the accounting matrix. An additional column has been introduced to represent the rest of the world as a macroeconomic sector. The domestic side of the system is equivalent to the system discussed in Section 3.4—firms hold deposits but there is no stock market. However, the complexity of the domestic financial system has increased as a result of the separation of the banking system into "banks" and a central bank. There are thus two additional columns included in the matrix.

To approximate the case of the Chinese economy, it is assumed that the exchange rate is fixed and international capital movements are prohibited. This requires that any trade imbalance is counteracted by the purchase or sale of foreign currency by the central bank. The assumption of capital controls implies that deposits remain the only financial asset available to households for the purpose of saving.

	Households	Firms (cur)	Firms (cap)	Banks	Central Bank	ROW	Total
Consumption	$-C$	$+C$					0
Investment		$+I$	$-I$				0
Net Exports		$+X$				$-X$	0
GDP		$[Y]$					
Wages	$+W$	$-W$					0
Profits		$-S_F$	$+S_F$				0
Deposit interest	$+r_D \cdot D_{H(-1)}$	$+r_D \cdot D_{F(-1)}$		$-r_D \cdot D_{(-1)}$			0
Loan interest		$-r_L \cdot L_{(-1)}$		$+r_L \cdot L_{(-1)}$			0
Net fin. balance	$[S_H]$	$[0]$	$[S_F - I]$	$[0]$		$[-X]$	
Change in deposits	$-\Delta D_H$		$-\Delta D_F$	$+\Delta D_b$			0
Change in loans			$+\Delta L$	$-\Delta L_b$			0
Change in FX					$-\Delta FX$	$+\Delta FX$	0
Change in reserves				$-\Delta R$	$+\Delta R$		0
Change in advances				$+\Delta A$	$-\Delta A$		0
Sterilisation				$-\Delta B$	$+\Delta B$		0
Total	0	0	0	0		0	0

Table 3.8 – Foreign trade and sterilisation.

The transactions of the foreign sector are straightforward. Exports and imports have been combined into one "net exports" item, represented by X. The discussion will assume that the domestic economy is running a trade surplus, so that this variable is positive. This implies an addition to total domestic aggregate demand of magnitude X. Firms are therefore in receipt of higher revenues than would be the case in the absence of the trade surplus. These additional revenues will be paid in foreign exchange. Assuming that firms are required to surrender these foreign exchange earnings to banks, and these banks in turn are required to surrender foreign exchange to the central bank, an amount of foreign exchange equivalent to the trade surplus will thus accrue with the central bank.

With the inclusion of a trade surplus, the requirement that total domestic saving and investment be equal no longer holds. This can be seen by extracting the *net financial balance* row from the matrix:

$$S_F = I - S_H + X$$

Thus domestic saving is equal to the sum of investment and the trade surplus. In this form, the equation also shows how the trade surplus serves to offset the profits "lost" by firms to the saving of households.

The greatest complexity is involved with the interactions of the banks and the central bank. The analysis in the previous sections of this chapter has assumed a single unified banking system, resulting in a Wicksellian pure credit system.

The current model may also be regarded as a pure credit system but instead of the banking system passively accommodating all demands for loans from the firms sector—as has been implicitly assumed until now—the requirement for banks to hold reserves at the central bank is now introduced.

These reserves may be obtained by banks in one of two ways: either by surrendering foreign exchange reserves, or by drawing on advances from the central bank. Central bank reserves equal to a proportion of total deposits must be held—a required reserve ratio. If θ is the required reserve ratio, then the balance sheet of the banks sector must comply with the following identity:

$$R = \theta D$$

In the case of a balanced trade account, the lending operations of banks will be constrained if the central bank does not provide these advances on demand. However, the inflows of foreign exchange that occur in the case of a trade surplus

will reduce this reliance on central bank advances, curtailing the power of the central bank to restrain lending by restricting the supply of reserves. This is due to central bank intervention in the foreign exchange markets to buy up the foreign earnings of firms. This process takes place via the banking system: firms surrender their foreign exchange earnings in exchange for domestic bank deposits. In turn the banks exchange foreign exchange for reserves with the central bank.

The balance sheet of the domestic banking system therefore expands, but the increase in deposits on the liability side of the balance sheet will be backed on the assets side by reserves with the central bank, not loans. Since only a proportion of deposits are required to be backed by reserves this will allow for a greater expansion of lending by the banking system since an equal expansion of reserves and deposits on opposite sides of the banks balance sheets will lead to a reduction in the current deposits to reserves ratio.

Whether or not the holding of excess reserves by the banking system leads to an expansion of lending depends primarily on whether loans are demanded by firms, given the rates of interest on loans and deposits. In the absence of such demand, the result of a trade surplus will simply be the accumulation of excess reserves by the banking system. However the central bank may choose to sterilise the additional reserves by either converting excess reserves into required reserves or substituting excess reserves for alternative central bank liabilities.

The first is achieved by raising the required reserve ratio, θ, so that as reserves accumulate and the reserve to deposit ratio rises, the required reserve ratio rises at an equal rate. The second option, shown in the in matrix by the entry "sterilisation", takes place through the open market operations of the central bank: by issuing illiquid liabilities (bills, B, in the current example), the central bank replaces the excess reserves of the banking system with alternative liabilities that are ineligible for reserve requirements. Godley & Lavoie (2005–06) argue that in the case of a central bank which is targeting an overnight rate of interest, these sterilisation operations will happen "endogenously"—excess reserves will push down the overnight rate of interest, requiring the central bank to sell securities in order to push the rate of interest up again. Even in the case of a system in which overnight rates of interest are not closely targeted, the central bank will almost always be able to force reserves out of the system by offering to sell securities that provide a higher yield than that paid on excess reserves.

This raises the issue of the interest paid on the various additional financial instruments introduced into the analysis in the current section. For the sake of

simplicity, it has been assumed that no interest is paid on the instruments in the final four rows of the matrix and as a consequence the central bank imposes no spread between advances and reserves and sterilisation bills.

In general, this will not be the case. The structure of relative interest rates on foreign exchange (held as foreign government debt for example); central bank reserves; advances and bills, will result in either costs or revenues for the banking system and the central bank. The banking system will face a spread between the rate of interest paid on deposits and the rate received on reserves and bills. The central bank will face a spread between the rates paid on reserves and bill and rates received on foreign exchange. (This point is considered in more detail in the case of China in Section 7.3.2).

This accounting model demonstrates a number of important points. Firstly, the conclusion of the standard open-economy model of Mundell and Fleming that control of monetary policy will lost in the case of fixed exchange rates and capital mobility is an extreme over-simplification. Even though a closed capital account was assumed for this discussion, even in the case of free capital movement, a large number of factors will serve to determine whether flows occur that equalise returns across all assets, including the relative substitutability, liquidity and risk of those assets. Further, the Mundell-Fleming analysis fails to distinguish between "inside" and "outside" money—increases in reserves will not translate into an expansion of the "money supply" if firms choose to substitute loan-financed investment with investment financed using the deposits obtained in exchange for surrendering export earnings.

Secondly, the current model demonstrates the flaws of the "saving glut" argument which holds that global imbalances are the result of the high saving propensity of Chinese households:[8] this can be illustrated by considering, as before, the extreme case in which households consume their entire income. Then, in the case of a balanced trade account, all profits will accrue to the firms sector. Expansion of output will be made possible by additional bank lending to the firms sector. If the firms sector as a whole holds the resulting profits as bank deposits, reserves will be provided by the central bank to the banking system in order to accommodate the increase in deposits. This is an identical situation to the case of overcapitalisation described in Section 3.4, with the difference that the central bank is now explicitly incorporated.

If this expansion of investment by firms increases the domestic productive

[8]Eg. Bernanke (2005)

capacity of some products that were previously imported, such as intermediate goods, this will result in higher domestic output and and a trade surplus. As described above, the trade surplus will increase the level of reserves in the banking system. If the increase in aggregate demand resulting from the trade surplus stimulates a further increase in investment, the increase reserves of the banking system will be either partially of fully absorbed by this new lending, serving as the required reserves for the increased level of deposits. If firms do not continue to increase the rate of expansion, these reserves will remain as excess reserves in the banking system, or may be absorbed by increases to the required reserve ratio or the issuance of bills.

In either case, the key point is illustrated by the configuration of the final balance sheets of the system: If firms have chosen to repay past loans out of profits, total deposits of firms will equal the total volume of foreign exchange on the central bank balance sheet. If firms are overcapitalised due to choosing not to repay loans, then all loans and deposits will be held on the balance sheets of firms, with the excess of deposits over loans equal to the cumulative trade surplus.

In this example, the "savings glut" is fully accounted for by the profits of firms resulting from export demand. Even in the case of a lower mark-up, such that saving also accumulates as household deposits, the cause of this accumulation will not be located in the saving propensity of those households. A reduced propensity to save by households would only reduce the trade surplus to the extent that additional household expenditure is directed towards imported goods. If households were to increase their consumption of domestic goods, this would simply stimulate a further expansion of domestic demand.

3.7 Conclusion

The chapter has used the stock-flow consistent framework as the basis for the analysis of a number of phenomena of direct relevance to the recent economic history of China. The analysis focuses on the financial and monetary implications of credit-financed investment; saving and overcapitalisation in the firms sector; export earnings and the operations of the central bank—topics that have largely been overlooked or mis-represented in academic discussions.

While fully-specified mathematical models have not been presented, the stock-flow consistent system has been used to organise discussion of these phenomena in the context of a framework that ensures that the balance sheet effects of all eco-

nomic interactions are fully accounted for. This allows for flexibility in analysing the implications of different assumptions while exploring the "state space" of alternative institutional structures. This analysis is extended in a more formal way in the following chapter.

In demonstrating the balance sheet effects of the above phenomena, this chapter lays the ground for the flow-of-funds analysis in Chapters 6 and 7. Although the data categories of the empirical accounts are significantly more detailed and complex than the simple framework used here, they are dominated by the dynamics of a number of key processes: investment financed with retained earnings and bank credit; the saving of firms and households; export earnings; and the operations of the banks and central bank. Thus the balance sheet configurations which emerge in the abstract models in the current chapter will be replicated in the concrete empirical analysis in these later chapters.

Chapter 4

Growth, income distribution and money

4.1 Introduction

The previous chapter begins the development of a theoretical approach based on the flow-of-funds accounting framework. The accounting system is used as the basis for analysis of the monetary consequences of various possible configurations of investment, profits and saving in the household and firms sectors, as well as an examination of the balance sheet effects of sterilisation operations. The analysis focuses on the monetary effects of various possible configurations of saving and investment at the level of macroeconomic sectors, while taking as given the real sector balances that generate the expenditures and imbalances which underpin these monetary phenomena.

This chapter extends this analysis by examining the dynamics of these real sector processes in the context of economic growth. A survey is presented of those approaches to growth and distribution which form an alternative to the models constructed on the basis of the neoclassical aggregate production function discussed in Chapter 2. In particular, the Cambridge growth models of the 1950s and 1960s are contrasted with the analysis of Steindl and the post-Keynesian Kaleckian growth model.

Both classes of models are designed to formalise the view that investment, not saving, is the key behavioural variable for determining growth. An important distinction is to be found, however, in the mechanism by which saving adapts to this desired rate of investment. In the Cambridge models, this accommodation

either occurs through shifts in the real wage or in the price of financial securities at a fixed rate of employment. In the analysis of Steindl, the effect of retained profits and excess capacity in determining the investment expenditures of firms plays the central role. This mechanism also features in the Kaleckian growth model such that changes in the rate of capacity utilisation provide the mechanism by which saving adapts to growth.

The distributional consequences of changes in the rate of growth are thus different in each class of model: the Cambridge models require a shift from wages to profits to accommodate higher growth, whereas higher growth is associated with a higher real wage in the Kaleckian model.

In Section 4.6, the Kaleckian growth model is integrated with the pure credit monetary system developed in Chapter 3. This allows for an integrated analysis of the monetary phenomena discussed in that chapter with the processes of growth and distribution examined in this chapter. The resulting monetary growth model is used to illustrate the Steindlian theoretical framework used as the basis of the flow-of-funds analysis in Chapters 6 and 5.

4.2 Cambridge growth models

An alternative to the Solow-Swan analysis of growth and distribution began to be developed in Cambridge, UK from the late 1950s in a series of papers primarily authored by Kaldor and Pasinetti, informed by exchanges with US economists such as Samuelson and Modigliani. The initial contribution to this strand came with Kaldor's preliminary attempt at a sketch of a "Keynesian" theory of growth and distribution, inspired in part by the criticisms of the aggregate production function approach by Joan Robinson and others:

> In fact the whole approach which regards the share of wages and of profits in output as being determined by the marginal rate of substitution between Capital and Labour with its corollary, that the constancy of relative shares is evidence of a unity-Elasticity of Substitution between Capital and Labour—is hardly acceptable to present-day economists. Its inadequacy becomes evident as soon as it is realized that the "marginal rate of substitution" between Capital and Labour-as distinct from the marginal rate of substitution between labour and land-can only be determined once the rate of profit and the rate of

wages are already known. (Kaldor, 1955, p. 91)

Kaldor's starting point in formulating an alternative approach to the problems of growth and distribution is the difference in propensities to save out of different types of income. If income, Y, is divided into wages, W, and profits, P, then the total volume of saving forthcoming, S, will be equal to the sum of saving out of wages and out of profits. The volume of saving from each class of income will be determined by the propensity to save of wage-earners, s_w, and capitalists, s_p respectively:

$$Y = W + P \tag{4.1}$$

$$S = s_w W + s_p P \tag{4.2}$$

Like Kalecki ([1939] 1990; [1954] 1965), Kaldor assumes that the propensity to save out of profits is greater than that of the propensity to save out of wages. Then, by setting saving equal to investment, some simple algebraic manipulation generates the result that, with given saving propensities, the functional distribution of income—the division between wages and profit—depends only upon the relative size of investment in output:

$$\frac{P}{Y} = \frac{1}{s_p - s_w}\frac{I}{Y} - \frac{s_w}{s_p - s_w} \tag{4.3}$$

In the special case emphasised where "workers spend what they get and capitalists get what they spend", $s_w = 0$, giving the well-known result that $P = I$. The rate of profit—the volume of profit divided by the value of the capital stock—may be determined similarly:[1]

$$\frac{P}{K} = \frac{1}{s_p - s_w}\frac{I}{K} - \frac{s_w}{s_p - s_w}\frac{Y}{K} \tag{4.4}$$

This model may be regarded as Keynesian in that investment is the active variable—the exogenously determined rate of capital accumulation is independent of the saving propensities of either workers or capitalists. However, this independence is the result of assuming a pricing mechanism that operates such that the real wage adjusts to accommodate any given desired rate of investment. Thus, in producing a model which captures one key Keynesian result, Kaldor is

[1] This result is presented in Pasinetti's 1962 reformulation of Kaldor's model (discussed in subsequent paragraphs).

forced to drop another central pillar of Keynesian theory in that the system is assumed to operate at a point of full employment. The functional distribution of income is thus determined by the exogenous rate of investment—an increase in the level of investment is matched by a corresponding increase in desired saving through redistribution from lower-saving-propensity workers to higher-saving-propensity capitalists.

It is possible to detect hints of Say's Law in this adjustment mechanism. Although investment takes the active role with saving adjusting passively, it is assumed that a price adjustment mechanism operates such that variations in employment and capacity utilisation are ruled out. Thus, the price of output goods (or, equivalently, the real wage) takes the place of the rate of interest in the classical system.

This price adjustment mechanism also provides an alternative to the capital-labour ratio adjustment process of the Swan-Solow growth model. Assuming investment to be exogenous and at a level equivalent to Harrod's 'natural rate of growth'—that which is just sufficient to cope with technical progress and population growth—the instability arising from divergences between this 'natural' rate and the actual, or 'warranted' rate in Harrod's model can now be overcome by changes in the distribution of income that cause an adjustment in the overall level of saving.

Despite the somewhat unsatisfactory nature of this adjustment mechanism, Kaldor's formulation was greeted with enthusiasm by Pasinetti, who wrote:

> One of the most exciting results of the macro-economic theories which have recently been elaborated in Cambridge is a very simple relation connecting the rate of profit and the distribution of income to the rate of economic growth, through the interaction of the different propensities to save... it represents a break with the hundred-year-old tradition of marginal theory. (1962, p. 267)

Nonetheless, Pasinetti goes on to point out a flaw—or perhaps an oversight—in Kaldor's reasoning. In assuming two types of income (wages and profits) with different propensities to save out of each, Kaldor overlooks that fact that saving out of wage income will result in the "ownership" of capital by wage-earners, whether through direct equity ownership or indirectly through, for example, holdings of liquid bank balances. Thus, the formulation $S = s_w W + s_p P$ either assumes that workers have the same propensity to save out of profits as

do capitalists or that "workers' savings are always totally transferred as a gift to capitalists... [which is] an absurdity"(Pasinetti, 1962, p. 270)

This oversight may be viewed as resulting from the tendency of the Cambridge theorists of this era to almost entirely ignore questions of money and finance. The form in which households hold their savings—whether it be bank balances, or financial securities—is not considered. Casting investment in the active role thus results in the often implicit assumption that either households choose to hold their savings in the form of financial securities issued by firms or that the supply of bank credit expands to accommodate all the liquidity requirements of firms' investment. In failing to specify the terms on which household saving is made available to firms for investment purposes, Kaldor also overlooks the accounting that is required to track the payment flows which must inevitably be associated with the holding of such financial stocks.

Passinetti takes these problems into account and attempts to overcome them in a re-formulation of Kaldor's model, by replacing the propensity to save out of profits, s_p, with a propensity to save of capitalists, s_c and explicitly including workers' saving out of profits to give the following saving identity:

$$S = s_w(W + P_w) + s_c P_c \tag{4.5}$$

Pasinetti is thus able to present a modified version of the model in which income distribution and the rate of profit are more carefully integrated with financial flows. By assuming that in long-run equilibrium the rate of interest and the rate of profit are identical and that the proportion of capital owned by workers is equal to the proportion of workers' saving in total saving, the following two results are obtained:

$$\frac{P}{K} = \frac{1}{s_c}\frac{I}{K} \tag{4.6}$$

$$\frac{P}{Y} = \frac{1}{s_c}\frac{I}{Y} \tag{4.7}$$

The implications of these two results are that, in long-run steady-state growth, the rate of profit and the functional distribution of income—the division between profits and wages—are independent of the saving propensity of workers, and depend only upon the saving propensity of capitalists and the rate of accumu-

lation.[2] In locating a such an asymmetry between the significance of the saving decisions of workers and capitalists, Pasinetti regards his model as resurrecting a key result from the classical writers which had been sidelined since the onset of marginalist theories. On the one hand, "since the rate of profit and the income distribution between profits and wages are determined independently of [workers' saving propensity], there is no need for any hypothesis whatever on the *aggregate* savings behaviour of workers", while on the other "the relevance of the capitalists' propensity to save... uncovers the absolutely strategic importance for the whole system of the decisions to save of just one group of individuals". (1962, p. 274)

Pasinetti's results prompted a lengthy and elaborate response from Samuelson & Modigliani (1966) in which they argued that the relevance of Pasinetti's result related not to some 'alternative' theory of income distribution of income theory, but that the result held more generally—including in marginalist models of distribution—provided certain conditions were met. Alternatively, they argue that if the "Pasinetti condition"—the assumption that the saving propensity of workers is lower than the share of investment in income—were not to hold, then an "anti-Pasinetti" regime would exist such that in the long run capitalists would be "saved out of existence" by workers. Armed with this "anti-Pasinetti" regime, "a way seemed open for reinstating marginal productivity analysis based on the flexibility of technical coefficients." (Lavoie, 1998, p. 418)

Kaldor responded again, opening his attack with the claim that,

> Professors Samuelson and Modigliani have written a long critical essay on macro-economic theories of distribution which demonstrates, not only the splendid analytical powers of the two authors, but also the intellectual sterility engendered by the methods of neo-classical economics. (Kaldor, 1966, p. 309)

In addition to the authors' reliance on the flawed "well-behaved" aggregate production function, Kaldor also presented a refutation of the anti-Pasinetti regime.

[2]The result relies on the inclusion of restrictions on the relative propensities to save of workers and capitalists, such that the propensity to save of workers is less than the proportion of investment in output, and the propensity to save of capitalists is conversely greater than this ratio. Note however that the same result does not hold for the distribution of income between workers and capitalists. Since the profit income received by workers is determined by the proportion of their income that is saved, the saving propensity of workers will affect the division of total profits between capitalists and workers, and thus the overall distribution of income between the two classes.

This result, he argued, relied on two mistaken assumptions: firstly that the relative propensities to save out of wages and profits were connected to individuals, rather than to types of income. Thus, there was no change in the saving propensity of workers as they gradually evolved into capitalists as their wealth accumulated. Rather, Kaldor argued, it is the type of income—profits or wages—that determines the propensity to save, rather than the individual or group that undertakes the saving. Secondly, Kaldor attacks Samuelson and Modigliani's attempt to drop the "Kaldor-Pasinetti" inequality: that the share of investment in output is greater than the share of saving from wages. In dropping this assumption and allowing workers' saving propensity to exceed the rate of investment, the Keynesian hypothesis that investment leads saving must be dropped, leading back to the neo-classical world in which "there is necessarily just enough investment to finance full employment savings—where, in other words, savings *govern* investment and not the other way round." (Kaldor, 1966, p. 311)

As part of his response to Samuelson and Modigliani, Kaldor introduced his "neo-Pasinetti" model. In this model, he attempted to reproduce Pasinetti's result that the saving propensity out of wages will not affect the rate of profit, while doing away with both the possibility of an "anti-Pasinetti" regime, and with the requirement of long-run steady-state growth. (Lavoie, 1998)

Kaldor's model hinges on the innovation of allowing agents' consumption expenditures to exceed their incomes: he thus explicitly introduces into the "Cambridge" strand of Post-Keynesian models the potential for agents to issue financial liabilities to cover expenditure over and above current income. By introducing equity financing into the Cambridge model, Kaldor also brings out into the open the distinction between the ownership of capital goods and the ownership of equity. In previous iterations of the model, two saving propensities were distinguished—that of workers and that of capitalists—but exactly *who* was making the decision that resulted in the saving propensity of the capitalists was not clear: was it managers of firms deciding on dividend pay-outs or the households that own securities making saving decisions?

Kaldor's model makes this division explicit by assuming that two separate decisions are made: the saving propensity of "capitalists" determines firms' retained earnings while the consumption decision of equity holders in combination with the propensity to save of workers determines the overall saving of the household sector. Any excess of investment over the level of retained earnings is financed by the issue of securities. Kaldor further makes the critical assumption—

upon which the results of the model depend—that the owners of financial securities may choose not only to consume their entire dividend income, but may also consume in excess of this income by selling securities to realise capital gains. For goods market equilibrium, saving out of wages must therefore be exactly sufficient to finance both investment in excess of retained earnings, and the consumption of holders of securities out capital gains. These assumptions result in a saving function of the following form:

$$S = s_w W + s_c P - c(vI - iI) \tag{4.8}$$

In this function, v is the valuation ratio (or Tobin's q—the ratio of equity prices to capital goods prices), i is the proportion of investment financed by issuing new assets, and c is the proportion of capital gains that equity owners choose to consume by selling securities to wage-earners. In combination with an identity for securities-market equilibrium, Kaldor demonstrates that in his model, desired saving will always adjust to desired investment, regardless of the saving propensity of households.

The mechanism that ensures this equality between saving and investment, however, once again turns out to be rather unsatisfactory. Kaldor assumes that all household saving takes the form of equity purchases, and that the valuation ratio v—Tobin's q ratio—adjusts such that household saving settles at exactly the level required to finance new investment and off-set dis-saving out of capital gains. Thus the neo-classical adjustment mechanism—smooth factor substitution within an aggregate production function—is replaced by another which also has more than a whiff of the neo-classical about it. As Davidson (1968) points out, by assuming that all household saving is used to purchase financial securities which entitle the holder to dividend payments, Kaldor essentially makes the rate of return on securities the price which ensures equilibrium between saving and investment at full employment! (This even prompted Samuelson to refer to "Jean-Baptiste Kaldor" (Davidson, 1968)).

Despite the shortcomings of Kaldor's model, all was not lost: two possible routes back to firmer Keynesian ground seemed possible. The first relates to Davidson's point that the Say's Law-like results of Kaldor's model depend on the problematic assumption that saving out of wages all takes the form of eq-

uity purchases.[3] Equities thus take a role equivalent to that taken by bonds in the Keynesian model, such that the supply and demand of securities interact to determine the equilibrium rate of return. However in the absence of any alternative financial asset, all saving is invested in securities, implying that the rate of return on those securities operates essentially as an equilibrium real rate of interest. If the possibility of households holding liquid money balances were to be introduced into the model, the equity "valuation ratio" would be released from this Say's Law-like equilibrating role.

Secondly, like the previous iterations of Cambridge models discussed above, Kaldor's model operates under the assumption of a given rate of capacity utilisation. Although this does not imply, as some authors believed, a level of capacity utilisation equivalent to the full employment rate of output (and thus a Golden Age equilibrium growth path), the assumptions of a given rate of capacity utilisation and an exogenous rate of capital accumulation exclude the possibility of aggregate demand-driven changes in the rate of output and employment from operating as the mechanism that brings saving into line with investment decisions. Davidson argued that once a portfolio choice mechanism was incorporated into the model, and the rate of employment was allowed to vary with a given capital stock, the usual Keynesian results would be reinstated:

> ... it is either changes in output (at less than full employment) or inflationary changes in wages and prices at full employment which constitutes the prime channels for working the appropriate changes in the level of personal savings to bring it into equilibrium with the exogenously determined level of investment. The rate of growth, on the other hand, is determined in a modern economy by the investment decisions (of business firms) which can be actually financed and carried out within the monetary and resource constraints of society. (Davidson, 1968, p. 268)

Davidson made an attempt at providing an improved system in his 1972 book *Money and the real world*, but the version of the model he presented was not much

[3]The formulation of the model also gives the impression that the proceeds of any new issuance of equity by firms is used for the purpose of investment. However, in the accompanying discussion it is clear that Kaldor does not believe this to be represent the general case: "in other words, they issue securities periodically, to make good any past depletion of their liquid reserves; in the converse case, they respond *ex-post* to an accretion of cash reserves by redeeming securities". Thus, it is the management of balance sheets to maintain adequate stocks of liquid reserves that Kaldor emphasises, although such operations were ruled formally out by the structure of Kaldor's model.

of an improvement on Kaldor's version because, as Lavoie (2008b), notes, "despite distinguishing between stocks of capital and flows of investment in the earlier chapters, he introduced a flow parameter to deal with what was essentially a stock issue, that of the choice between stocks of shares and money, when attempting to add money to the neo-Pasinetti framework"

By this time, the failure of the Cambridge Keynesians to convincingly integrate monetary factors and aggregate demand into long-run models of distribution and growth was attracting criticism from the U.S. Keynesians, with Kregel writing in 1985 in the *American Economic Review* on "Cambridge Macroeconomics without Money: Hamlet without the Prince". Nonetheless, it was to be some time until any significant progress was made on the question of how to integrate the insights of the U.S. scholars on monetary and financial issues into the U.K. Cambridge models.

4.3 Steindl's theory of stagnation

While the Cambridge economists were busy constructing models that demonstrated that the saving of households held no relevance for the outcomes of the system, they appear to have been largely unaware of a previous, rather more sophisticated analysis which came to quite different conclusions. While Kalecki tended to theorise in terms of cycles around the steady state, his follower Josef Steindl used a closely related analytical framework to analyse the long-run interaction between growth, stagnation and saving. The key distinction between the approach of Steindl and that of the Cambridge authors is that, while Kaldor and Pasinetti assume a competitive system of fixed output and employment, Steindl follows Kalecki in analysing the implications of an oligopolistic market structure and the potential for excess capacity.[4]

Steindl's book *Maturity and Stagnation in American Capitalism* (1952), is an attempt to provide an explanation for the secular decline in the growth rate of the American economy which culminated in the decade of depression which preceded the second World War. In Steindl's analysis, what lies at the heart of this decline is the inability of saving to adapt to a reduced rate of capital accumulation: "the economy is unable to adjust to low growth rates because its saving

[4]Kaldor provides a brief and dismissive summary of Kalecki's theories which he describes as based on a "purely tautological approach according to which the ratio of price to prime costs is *defined* simply as the 'degree of monopoly'." (1955, p. 91)

propensity is adjusted to a high one" (Steindl, 1979, p. 1)

This rigidity stems from the saving behaviour of both firms and the public. With increasing concentration in the firm sector, the saving of firms becomes increasingly inelastic. This is a consequence of changes in the way that firms respond to the unused productive capacity which results from an increasingly oligopolistic market structure. The existence of undesired excess capacity, and the way that firms react to it, are the central elements of Steindl's analysis:

> It is surprising that this equilibrium excess capacity should never have been dealt with in the same way as other forms of idle reserves, for example, stocks of commodities, or balances of money. It would then have to be explained as a reserve held in anticipation of future events, or in view of some existing uncertainty. (1979, p. 9)

Steindl argues that in a competitive market, firms will react to excess capacity by cutting prices and thus reducing the mark-up on costs and thus profit margins. However, this cost-cutting will drive out "marginal" producers, resulting in rising concentration. Once competition gives way to oligopoly, firms become wary of cost-cutting and cease to react to excess capacity.

This leads Steindl to explicitly incorporate the distribution of profits within the capitalist class into the theory. The long-run tendency towards increasing industrial concentration results in a "cartelised" sector of the economy, characterised by a high degree of monopoly. At the same time, it is argued, there remains a fringe of firms operating in markets which reasonably approximate a competitive structure. The relative inelasticity of mark-ups in the cartelised sector of the economy implies that gross profit margins will be higher for firms in this sector. Further, the tendency towards increased concentration will result in a rise in the relative share of profits accumulating in the cartelised sector, at the expense of competitive firms. This "maldistribution of profits" will in turn lead to disproportionately higher gearing ratios in the competitive firms sector.

Steindl thus develops and refines Kalecki's insight that a long-run rise in the degree of monopoly will be associated with a redistribution of profit income to monopolised sectors of the economy at the expense of competitive firms:

> The changes in the degree of monopoly are not only of decisive importance for the distribution of income between workers and capitalists, but in some instances for the distribution of income within the capitalist class as well. Thus, the rise in the degree of monopoly caused

> by the growth of big corporations results in a relative shift of income to industries dominated by such corporations from other industries. In this way income is distributed from small to big business (Kalecki, [1954] 1965, p. 18)

Like Kalecki, Steindl's analysis is first carried out in the context of an individual industry, assumed to be "self-contained" in that firms do not invest outside their own industry. The theory is then extended to the case of the economy as a whole.

4.3.1 The case of an individual industry

In an industry where competitive conditions prevail, Steindl argues, there exist forces which operate to prevent the build-up of idle productive capacity. These mechanisms operate primarily through their influence on the gross profit margin. Increasing concentration of industry leads to a reduction in the elasticity of the mark-up, and thus the gross profit margin, with respect to excess capacity.

Concentration of industry is seen by Steindl as an inevitable consequence of cost-cutting innovations. As some firms introduce lower-cost technologies, the increased profit margins, and thus retained earnings, of these "progressive" firms generate "internal accumulation" (retained earnings) in excess of that which may be absorbed by investment, given the rate of expansion of the industry as a whole. Steindl argues that this accumulation will lead to an "explosive force": price-cutting by lower-cost progressive firms will cause higher-cost firms to be driven out of the industry. This expulsion of high-cost firms will act to reduce profit margins once more, but will lead to a new equilibrium with fewer total firms.

The relationship between sales growth, capacity utilisation and profit margins for an industry in which a process of concentration is underway can be analysed algebraicly as follows. The overall rate of sales growth R, for the industry as a whole is dictated by the growth of demand and is thus initially assumed to be exogenous. The overall rate of expansion of sales *for those firms which remain in the industry* at the end of a period in which a process of elimination has taken place may then be decomposed into component rates of change, as in the following equation,

$$R = u' + g' - k' - c + \alpha \tag{4.9}$$

in which c denotes the ratio of eliminated firms' sales to total industry sales and

the other terms represent proportionate rates of change of the following magnitudes: capacity utilisation u', the gearing ratio, g', capital intensity k' and retained earnings α (Steindl, 1952, p. 48).[5]

For any given firm, the rate of internal accumulation α, is determined by the *net* profit margin, which at a given price of output is a function of the cost of production and the level of capacity utilisation:

> The net profit margin can, in fact, change for two quite different reasons: either because of a change in utilisation of capacity, with an otherwise unchanged structure of costs and prices; or the net profit margin can change at a *given level of capacity utilisation*. (Steindl, 1952, p. 46)

If the possibility of elimination of high-cost firms is initially put to one side, with the rate of sales growth, R, assumed constant, an increase in the growth of retained earnings, α, can only be accommodated by a fall in the rate of capacity utilisation (as a result of over-investment), an increase in the capital intensity of production, or a fall in the gearing ratio.

Steindl argues that, of these possibilities, an increase in capital intensity is the most feasible "outlet for funds". It is unlikely that leverage will be reduced in the face of the new profit opportunities presented by an expanding industry, and it is improbable that firms will voluntarily undertake investment in capacity that is likely to stand idle.

Aside from the possibility of increasing capital intensity of production, it can thus be seen that in the absence of elimination of high-cost producers, a maximum is set on the rate of internal accumulation, and thus profit margins, by the overall rate of expansion of the industry as a whole.[6]

> The conclusion which emerges ... is the following: the rate of internal accumulation is limited by the rate of expansion of the the industry and the rate of capital intensification. The net profit margin at given levels of capacity utilisation... is therefore also limited by these factors." (Steindl, 1952, p. 50)

[5]This result is derived from the following equation, by assuming that the proportionate rates of changes are small enough that the products of these rates of changes are negligible enough to be dropped: $(1+R)(1+c) = (1+u')\frac{1}{1+k}(1+g')(1+\alpha)$

[6]This result relies on the important assumption that firms do not invest outside their own industry, and thus enter into other, more rapidly expanding industries.

This conclusion holds in the case that "conditions where the process of absolute concentration is already over", but is modified in the case that cost-cutting innovations allow progressive firms to engage in competitive price-cutting, eliminating high-cost competitors and increasing market share. In this case, an increase in α is accommodated by a corresponding temporary increase in c, representing the rate of elimination of uncompetitive firms. Once this process of elimination has taken place, however, a new "equilibrium" is reached, with a lesser number of firms, in which internal accumulation is once more constrained by the factors described above.

At the industry-level, Steindl thus presents a rich analysis of the interaction between cost competition, capacity utilisation and profit margins in which he concludes that the rate of output growth for the industry as a whole acts as a restraint on the volume of profits that can be "absorbed" by firms in that industry over any time period. Other than increasing the capital intensity of production, this constraint can only be overcome through the elimination of high-cost producers by competitive price cutting.

4.3.2 Accumulation in the economy as a whole

This industry-level analysis can be extended to the case of the economy as a whole, with a few important modifications. Assuming now a fixed market structure, such that the elimination of low-cost firms is excluded from consideration, the equation expressing the dynamics of growth for an industry can be applied at the level of the entire economy. Rewriting Equation 4.9, and rearranging terms gives the following:

$$R + k' - u' = g' + \alpha \tag{4.10}$$

The variables must now be taken to represent rates of change for the entire economy, not an individual industry. This equation is in essence identical to the Keynesian identity that *ex post* saving must equal investment, expressed in growth terms. The left-hand side represents the growth rate of the capital stock, decomposed into growth rates of output, capital intensity and capacity utilisation. The right-hand side equals the growth rate of total saving, since α is the growth of "internal accumulation" while g' is the rate of change of the gearing ratio.

The meaning of the ratio g' which must now be reconsidered. Whilst at the

industry level this ratio refers to the ratio of borrowed funds to own capital, at the aggregate level it represents the ratio of "internal accumulation" to "outside saving" for the firm sector as a whole. Since g' is the *rate of change* of the gearing ratio, if "internal accumulation" and "outside saving" grow at an equal rate, then g will remain constant and $g' = 0$.

Achieving the desired value of this gearing ratio presents problems for firms, since it is co-determined by their internal accumulation and "outside saving"—the accumulation of financial assets by households. Any given desired gearing ratio will only be attainable if the growth rate of saving of households exhibits the same elasticity to the variables of the system as the rate of internal accumulation, an unlikely scenario. In particular, Steindl emphasises the case where, in the face of an initial fall in growth—due, for example, to an adjustment in one of the structural coefficients of the system—the rate of investment growth falls below the rate of (desired) saving growth.

In such a situation, the rate of profit will fall in line with the drop in the rate of accumulation. Since Steindl follows Kalecki in assuming that the saving of capitalists is determined as a constant proportion of profits, the rate of internal accumulation will likewise fall. The fall in the rate of profit will also lead to a reduction in the desired gearing ratio of firms, requiring that the growth rate of household saving be reduced by a *greater* degree than the rate of internal accumulation. However, since household saving is assumed to be less elastic than retained earnings, this is impossible and the gearing ratio *increases*. Equivalently, an exogenous increase in the rate of growth of the capital stock will lead to an increase in the rate of profit. This in turn increases the rate of internal accumulation and will therefore result in a reduction of the gearing ratio.

On the firms' side, the fall in the rate of profit will result from a reduction in net profit margins, but this reduction may be achieved either through a reduction in the price mark-up or through a fall in the rate of capacity utilisation. Which of these these predominates will largely be determined by the market structure: in a competitive market a reduction in profit margins at unchanged capacity utilisation is to be expected. However, in an oligopolistic market in which a process of concentration has been underway for some time, it is more likely that firms will react by scaling back on production than by reducing price mark-ups. This reduction in output will lead to an increase in unused capacity, which in turn is likely to trigger further reductions in the growth of investment.

Reductions in the rate of growth are thus likely to be self-reinforcing. The

resulting rise in the gearing ratio and fall in the rates of profit and capacity utilisation will cause feedbacks leading to further falls in the rate of accumulation. These effects will not be felt evenly across all firms, however. In particular, if the process of concentration in the oligopolistic sector of the economy leads to a rise in price mark-ups, this shift in income distribution towards profits in the cartelised sector will place downward pressure on aggregate demand. But this fall in aggregate demand will affect all industries simultaneously, and thus will reduce rates of profit disproportionately in the competitive sectors of the economy. Reduced accumulation is thus accompanied both by increased overall gearing, and a redistribution of profits from competitive to oligopolistic firms. This "maldistribution of profits" will result in the gearing ratio rising disproportionately in the competitive sectors of the economy as a greater share of profits accrues in the oligopolistic sector.

Steindl's analysis thus provides a detailed account of the processes which combine to generate long run trends in growth or stagnation. Like Kalecki, Steindl present his theoretical system first using a mixture of descriptive analysis and algebraic formalations. He then presents a complete mathematical macroeconomic model. While this model is not sophisticated enough to incorporate all the elements of his theoretical system, it contains a number of key features which have since become standard in the literature that based around post-Kaleckian growth models (discussed in more detail in the next section).

In Steindl's mathematical model, aggregate demand is determined by the investment decisions of firms and the distribution of income between firms and households—given the different saving propensities of the two classes. In addition to being a function of profits, as in Kalecki's model, investment is also influenced by the gearing ratio and the level of excess capacity. The inclusion of these additional arguments into the investment function alters the way that the system adjusts to a shift in the aggregate distribution of income: with an increase in the mark-up, and thus the gross profit margin, aggregate demand and output will fall. The resulting increase in the gearing ratio and rise in the level of excess capacity will induce a fall in the rate of investment, and thus the growth rate.

An important feature of Steindl's model is the inclusion of separate saving and investment functions, specified such that the rate of accumulation is determined endogenously by the combination of the distribution of income and the relative saving propensities of workers, capitalists and rentiers. In reversing the Cambridge system, and making investment endogenous and the distribution of

income exogenous, Steindl thus anticipates the better known "Kaleckian growth model" that emerged some thirty years later.

4.4 The Kaleckian growth model

4.4.1 Outline of the model

In the early 1980s a second wave of post-Keynesian growth models emerged. Like the previous generation of Cambridge models, these models largely overlooked financial and monetary considerations. However, these models did mark a significant step forward in that they relaxed the assumption of a constant rate of capacity utilisation. In the Cambridge models, the assumptions of a fixed level of output and fixed propensities to save out of wages and profits imply that the adjustment required for a higher rate of accumulation can only take place through a redistribution of income between wages and profits. With the assumption of a higher propensity to save out of profits than wages, higher investment requires a greater share of income to accrue as profits, with investment financed out of retained earnings. The resulting inverse relationship between wages and profits gave rise to "the generally accepted idea, derived from Cambridge growth models, that higher growth requires greater inequality" (Dutt, 1984).

Marglin and Bhaduri's description of the Keynesian objection to such a system is the following.

> [H]igher real wages should increase aggregate demand, at least under the assumption that the propensity to save out of wages is less than the propensity to save out of profits. Although higher wages may diminish the profit per unit of output, business will make up the difference by an increased volume of production and sales. If investment demand increases with the rate of capacity utilisation, there will be even greater aggregate demand, and both aggregate profits and the profit *rate* will be higher even as the profit *share* is lower (1990, p. 154)

Thus, if capacity utilisation is allowed to vary as in Steindl's model, a higher rate of accumulation may be accommodated without a change in the functional distribution of income: higher output with a given capital stock and an unchanged markup over costs (in the form of real wages) will result in a higher rate of profit.[7]

[7] "We need ... distinguish between between those shifts to and from profits which are due to ef-

It is this adjustment mechanism that is emphasised by more recent writers and its introduction serves to free such models from the long-run steady state analysis that confines the earlier Cambridge models.

As is well known, the notion of mark-up pricing is derived from Kalecki's (1971) work on the degree of monopoly power. As in Steindl's model, the newer "Kaleckian" models replace the competitive adjustment mechanism of the Cambridge models with a oligopolistic mark-up pricing mechanism such that economies may operate, even over the long period, at less than full-capacity output. The long run thus becomes, as Kalecki argued, no more than a sequence of short-run positions.

The Kaleckian growth model first appeared in two papers, Rowthorn (1981) and Dutt (1984), which appear to have been been written independently.[8] The Kaleckian model in its most basic form comprises a set of three equations: a pricing function, a saving function and an investment function (Lavoie, 2008b).

Pricing function

The pricing, or profits-cost function of the Kaleckian model derives from the national accounting identity which defines output as equal to wages plus profits,

$$pq = wL + rpK \tag{4.11}$$

where p is the price of output, q the quantity of output, w the money wage, r the rate of profit on capital, and K and L represent the quantities of labour and capital employed respectively. If a_L is defined as the productivity of labour, u as the ratio of output to full-capacity output, and v as the ratio of capital to full-capacity output, equation 4.11 can be rewritten as follows.[9]

fective demand, and those which result from changed price-cost relations independent of demand. The neoclassical tradition now *en-vogue* takes great delight in confusing these two states of a shift in profit. In fact, neoclassicism does not admit of anything but full utilisation in the long run, and even in the short run adopts the same assumption when considering practical problems. For the Keynesian tradition, on the other hand, the concept of utilisation is of central importance" (Steindl, 1979)

[8] According to Lavoie (1995), the main results were previously shown in a paper by Del Monte (1975), published in Italian. It seems appropriate that the model which has taken Kalecki's name should have first been published in a language other than English and attributed to to the English-speaking authors who subsequently discovered it.

[9] This formulation assumes away any fixed costs such as overhead labour. These may be included in more advanced formulations of the model.

$$rp(\frac{v}{u}) = p - wa_l \tag{4.12}$$

This equation expresses the identity that money profit per unit is equal to the sale price of output minus the cost of production. Rearranging for the rate of profit gives,

$$r = \frac{u}{v}(1 - \frac{w}{p}a_l) \tag{4.13}$$

The rate of profit on capital thus depends on real unit costs, the rate of capacity utilisation, and the capital to full-capacity output ratio. This can be expressed in terms of the Kaleckian monopoly mark-up. If this mark-up is denoted as τ, the gross profit margin is equal to the the following,

$$m = \frac{\tau}{1+\tau} \tag{4.14}$$

Substituting this into Equation 4.13 gives the Kaleckian profits-cost equation:

$$r = \frac{mu}{v} \tag{4.15}$$

Thus, the rate of profit depends on the mark-up, the level of output and the capital to full-capacity output ratio.

Saving function

In the Cambridge growth models, investment was held to take place at a constant exogenous rate. Thus, the saving function of these models is the determinant of aggregate demand. Once investment is included as an endogenous variable however, this function becomes a "saving" function proper: aggregate effective demand will now be determined by the intersection of the saving and investment functions.

The saving function of the Kaleckian model can be derived from Equation 4.6, the Pasinetti result, while the interpretation of the function must be adjusted, as just described.

In order to derive the Pasinetti result, it was assumed that saving is equal to the exogenously determined level of investment. The key innovation of the Kaleckian model is the assumption that the level of output and capacity utilisation are free to vary, even in the long run. Aggregate demand and thus investment

become endogenous variables. To locate the growth rate of saving, we therefore replace investment with saving in Equation 4.6 and rearrange:

$$\frac{P}{K}s_c = \frac{S}{K} \tag{4.16}$$

Since $\frac{P}{K}$ is simply the rate of profit, r, and $\frac{S}{K}$ is saving expressed in growth terms, we can write this expression as follows:

$$g^S = rs_c \tag{4.17}$$

Thus, saving—expressed in growth terms—depends only upon the rate of profit, and the propensity to consume of capitalists. While was a general result of the Pasinetti model, with the introduction of variation in capacity utilisation and a fixed mark-up, the Pasinetti result will no longer hold. Thus, this equation relies on the classical assumption that workers consume their entire income.[10]

Investment function

The final equation of the Kaleckian model is the investment function. The question of what determines the rate of investment—and thus growth—is potentially more controversial than what determines either the rate of saving or profit rate since both, in the current formulation, are derived from national accounting identities. The rate of investment, however, is held to be autonomously determined by the decisions of firms. The way in which firms make this decision, and the variables that enter into the decision-making process are thus the key determinants of the dynamic behaviour of any model. Furthermore, once the rate of growth is endogenised by specifying the level of investment as a function of the other variables in the model, the potential arises for feedback effects that either constrain growth or make the model unstable.

The original formulations of the model by Rowthorn (1981) and Dutt (1984)

[10]Lavoie states that this will be the result of either "the standard assumptions, i.e. there are no savings out of wages and salaries *or* the Pasinetti (1962) conditions apply." (1995, p. 794, emphasis added) This is mistaken, however: "the Pasinetti conditions" refers to the assumptions required for stability of the Pasinetti (1962) model, discussed previously. This condition is that the rate of interest on loans must equal the rate of profit, resulting in the rate of profit being unaffected by the propensity to save out of wages. This condition only applies, however, under the assumption of full employment output, such that the price mark-up (and thus real wage) adjusts to accommodate changes in the desired investment of firms. In a variable-capacity model of the current type, with a fixed cost mark-up (and thus fixed distribution of income between wages and profits) the Kaleckian saving function can only be obtained by assuming away saving out of wage income.

"assume that... investment decisions are made with regard for both the rate of profit and the rate of capacity utilisation" (Dutt, 1984, p.28). Thus, investment decisions are driven by profit expectations, which in turn are assumed to depend on the current rate of profit. In addition, investment is also held to depend upon the rate of capacity utilisation, as is central to Steindl's analysis. This gives rise to the canonical investment function of the Kaleckian growth model:

$$g^I = \gamma + \gamma_u u + \gamma_r r \tag{4.18}$$

Combining this equation with the saving function, Equation 4.17, gives what Rowthorn (1981) calls the realisation curve and Lavoie (1995) calls the effective demand function:

$$r = (\gamma_u u + \gamma)/(s_p - \gamma_r) \tag{4.19}$$

The solution to the Kaleckian growth model is to be found at the intersection of Equations 4.15 and 4.19. At this point, with a given price mark-up—and thus real wage—the rate of profit and level of capacity utilisation are such that the rate of profit, determined via the profits-cost equation, is that rate at which saving is equal to the level of investment desired at this rate of profit and rate capacity utilisation.

Stability of the model depends on a lower sensitivity of investment to the rate of profit than that of saving—the slope of the investment function with respect to profits (or, equivalently, to capacity utilisation) must be less steep than that of the saving function. Algebraically this implies:

$$s_p > \gamma_r + \gamma_u v/m \tag{4.20}$$

Intuitively this stability condition derives from the fact that, if the opposite were the case and investment were more sensitive to capacity utilisation than saving, then if capitalists were to make their investment decision based on overly-optimistic projections of the rate of capacity utilisation then the realised rate of capacity utilisation—given by the saving function—would be even greater than the expected rate. This would prompt a further increase in investment, and even higher output and capacity utilisation. If the stability condition, Equation 4.20 holds, the opposite will be the case: overly optimistic expectations of the rate of capacity utilisation will result in a level of investment at which the realised level

of capacity utilisation will be below the expected value, prompting a reduction in investment and convergence towards the point of equilibrium effective demand.

The key feature of this model lies in the fact that the Keynesian distinction between the long-run and the short-run is overcome: with the potential for capacity utilisation to vary, the long run simply becomes a sequence of short run positions, thus projecting into the long period a number of key Keynesian short-run features: "in particular, the model has shown that short-run macroeconomic paradoxes, such as the paradox of thrift or the paradox of costs, whereby a decrease in the propensity to save or an increase in real wages leads to an increase in output, could be extended to the long run" (Hein et al., 2010, p. 588). The paradox of costs here refers to the breakdown of the Classical relationship between profits and wages. That a decrease in the real wage does not necessarily result in higher profits and output was established by Kalecki ([1939] 1990), who demonstrated that "any increase in the degree of monopoly due to a wage cut reduces employment, the real wage rate and (for both these reason) the real wage bill, but it does not increase capitalist income expressed in stable values" (p. 280)

4.4.2 Critiques of the Kaleckian model

The Kaleckian model has attracted criticism from a number of quarters, in particular the neo-Ricardians and neo-Marxists. Unsurprisingly, the conclusion that, in the long-run, faster accumulation does not require a shift in income distribution from wages to profits has been questioned by members of these two schools.

Debate has focused on a number of related areas. In particular, questions have been raised over the stability of the model and around the assumption that capacity usage can persistently diverge from its long-run "normal" rate. Related to these queries, debate has taken place about the correct specification of the investment function. One development that has arisen out of this literature is that, with a modified investment function, the "paradox of costs" may not hold. Thus, growth may be either "wage-led" or "profit-led" depending on the parameters of the model (Bhaduri & Marglin, 1990). These critiques are surveyed in Lavoie (1995) and more recently in Hein et al. (2010). We briefly consider some of these issues now.

The point upon which most criticism of the Kaleckian model focuses is the question of whether long-run growth can take place at rates of capacity utilisation other than some long-run "normal" rate of capacity utilisation—as is the case in

the previous generation of Cambridge growth models discussed above.

These critical authors have proposed various alternative mechanisms by which long-run accumulation and capacity utilisation will converge to "normal" rates. These critiques may be distinguished from each other on the basis of the adjustment mechanism proposed: either the investment function is re-specified in an alternative form, or one of the "constant" terms in the model is assumed to vary in response to changes in capacity utilisation. The implication is thus that the Kaleckian model as described above is either incomplete or incorrectly specified. Once the model is augmented with an additional long-run adjustment mechanism, the possibility of a stable growth path at non-normal rates of utilisation disappears. Further, depending on the form taken by the adjustment mechanism, either one or both of the two key features of the model—the paradox of thrift and the paradox of costs—may be eliminated.

The point pushed by these authors is that the Kaleckian model in its canonical form represents a theoretically stable growth path that would in reality be subject to instability and thus would be unsustainable in the long run. In turn, Kaleckian authors have responded either by presenting arguments to support the position that utilisation may in fact deviate from its "normal" rate over the long run, or alternatively by rejecting altogether the concept of a "normal" rate of utilisation.[11]

If we consider first the possibility that one of the parameters of the model has been mis-specified as "constant", a number of arguments have been put forward suggesting reasons such parameters may in fact be subject to shifts, occurring in response to changes in capacity utilisation.

Firstly, associated with the original Cambridge models of Kaldor (1955) and Robinson (1962) is the idea that the profit margin, m, may not remain constant, but may increase in response to above-normal rates of capacity utilisation: nominal price rises would alter the distribution of income in favour of profits over wages in such a situation. In combination with a Robinson-type investment function in which the rate of investment depends only upon the profit rate (and not capacity utilisation), an increase in the profit margin implies a higher rate of profit (at any given rate of capacity utilisation), thus the economy converges to a new steady state in which capacity utilisation falls back to the normal rate, but at a higher rate of profit. In such a system the paradox of thrift is retained—saving adjusts

[11] Authors such as Dutt (1990) have argued against the concept of a normal rate of utilisation. Hein et al. (2010) contrast this point of view with references to both Kalecki and Steindl in which they refer to a "normal rate".

to match investment through a change in output—but the paradox of costs disappears: higher wages lead to lower profits and investment.

One obvious problem with this is that the price mechanism operates in the opposite direction to that put forward by Kalecki (1938; [1954] 1965). In Kalecki's model the degree of monopoly is *inversely* elastic to the level of capacity utilisation, this being central to his argument as to why the share of wages remains constant in national income.[12]

Other mechanisms have been proposed which also operate by converting one of the fixed parameters of the model into a "variable". These include such suggestions as that of Shaikh (2009) in which the retention ratio—the saving propensity of capitalists, S_f—is influenced by the rate of capacity utilisation, or various justifications for making the intercept term, γ, adjust in response to the level of capacity usage, for example as a result of intervention by a monetary authority (Duménil & Lévy, 1999), or constraints imposed by labour shortages Skott (2010).

Other critiques have focused on the specific form of the investment function. In the canonical Kaleckian model, investment is a positive function of both the rate of profit and the level of capacity utilisation (Equation 4.18). Since the rate of capacity utilisation plays a role in determining the rate of profit—higher rates of output result in a greater volume of profit for a given capital stock and thus a higher rate of profit—the rate of capacity utilisation therefore affects the rate of accumulation both directly and indirectly.

This aspect of the model has been criticised by neo-Ricardian authors such as Vianello (1985) and neo-Marxists such as Bhaduri & Marglin (1990). The neo-Ricardian critique centres on the assertion than firms will base their investment decision upon the long-run normal rate of profit, and the currently realised rate of profit will not affect firms' expectations of future profits. Firms' investment behaviour will thus be unaffected by deviations of capacity utilisation away from the long-run normal level, and the changes in the rate of profit that arise as a result. Since, in the absence of overhead labour at least, the long-run normal rate of

[12]In particular, Kalecki criticised Harrod's claims regarding the dynamic evolution of income distribution over the course of the cycle: "It was recently admitted by Mr. Harrod that the degree of monopoly increases in the boom and falls in the slump... Mr. Harrod was rightly criticised in that there exist other factors which influence the degree of monopoly in the opposite direction. For instance, in the slump, cartels are created to save profits and this of course increases the degree of monopoly, while they are afterwards dissolved in the boom because of improving prospects of independent activity and the emergence of outsiders... the influence of these factors in raising the degree of monopoly during the slump is stronger than that of the diminishing imperfection of the market." (1938, p. 111)

profit is determined only by the mark-up—and thus the gross profit margin, m—the neo-Ricardian critique in its most extreme form implies an investment function of the following form such that the only determinant of the rate of growth is the relative share of income going to profits and wages.

$$g^I = \gamma_m \cdot m \tag{4.21}$$

A related, and influential, critique of the Kaleckian investment function is made by Bhaduri & Marglin (1990) who observe that while an investment function of the above type implies that higher investment growth requires a more unequal distribution of income, the effect on total output of such a shift in income distribution from from profits to wages is ambiguous. This is due to the fact that the overall effect of a change in the distribution of income on aggregate demand will depend upon the relative strengths of the resulting shifts in consumption and investment demand. Given that a decrease in the profit share will cause a reduction in investment demand, the overall effect on aggregate demand and thus on output will depend upon whether this reduction in investment demand is more than offset by the increase in consumption demand associated with the increased wage share.

Two possible growth regimes are thus possible: in the case in which the rise in consumption demand outweighs the fall in investment demand associated with a greater share of wages in output, aggregate demand and total output increase despite the fall in the rate of accumulation. On the other hand, if investment demand is strongly responsive to the profit share and increases to more than offset the fall in consumption demand, then a fall in the wage share—and the real wage—is associated with higher output and higher growth.

While the investment decisions of firms are held to be inversely related to the profit share, Bhaduri & Marglin (1990) argue that the neo-Ricardian investment function above, in which the mark-up is the only determinant of the rate of accumulation, is problematic since investment decisions are usually held to depend upon the *rate* of profit, not the share of profit in income. Since, in the short period with a given capital stock, the rate of profit varies with both the mark-up and the rate of capacity utilisation, Bhaduri & Marglin (1990) argue that the neo-Ricardian investment function above is incomplete. However, they also argue against the use of an investment function of the following form, in which accumulation is a direct function of the rate of profit:

$$g^I = \gamma_r \cdot r \tag{4.22}$$

This is because an investment function of this type excludes the possibility of differentiating between the degree to which investment is stimulated by an increase in capacity utilisation on the one hand, and an increase in the mark-up on the other. Bhaduri & Marglin (1990) argue that firms will distinguish between these two effects when forming expectations about future profits:

> ... although it has been common to make the rate of investment depend simply on the rate of profit... this is theoretically unsatisfactory, because it does not go behind the rate of profit to its individual components. For instance, it is simply assumed that a given rate of profit will produce the same level of investment as results from high capacity utilisation and a low profit margin or from low capacity utilisation and a high profit margin. An investment function which depends simply on the rate of profit... neglects the possibility that, despite a high profit margin, investors may not be inclined to invest in additional capacity if massive excess capacity already exists. (p. 380)

At first glance, it would appear that the investment function of the Kaleckian model, Equation 4.18, overcomes this issue by including the rate of profit and the level of capacity utilisation as separate determinants of the rate of accumulation. However, these two effects are not independent since the rate of capacity utilisation enters into the decision-making process twice: once directly, and once as a determinant of the rate of profit. It is demonstrated by Bhaduri & Marglin (1990) that a function of this type imposes restrictions on the relative weights of capacity utilisation and the mark-up in the firm's investment decision. This results in the fact that the profit-led growth regime is ruled out in the Kaleckian model—the "paradox of costs" will hold under any parameter set.

Bhaduri & Marglin (1990) argue instead for an investment function specified in terms of the mark-up and the rate of capacity utilisation—the two components of the profit rate:

$$g^I = \gamma_m \cdot m + \gamma_u \cdot u \tag{4.23}$$

With such an investment function, Bhaduri & Marglin (1990) demonstrate that both "wage-led growth" and a "profit-led growth" are possible depending on the

relative elasticity of investment demand to capacity utilisation and the mark-up. This version of the model has subsequently become influential and has given rise to a significant empirical literature which aims to determine which of the two regimes characterise the growth path of various economies around the world.

Lavoie (1995) argues that the apparently separate critiques put forward by Bhaduri & Marglin (1990) and those made by the neo-Ricardians such as Vianello (1985), amount out to essentially the same thing. Since the neo-Ricardians argue that the long-run rate of profit should determine expectations about the profit rate and thus the level of investment, they are essentially arguing that the rate of profit at normal levels of capacity utilisation is the basis of investment decisions. Since, at the normal rate of capacity utilisation, the rate of profit is given by the gross profit margin, m, the investment function proposed by Bhaduri & Marglin (1990) is essentially a special case of that proposed by the neo-Ricardians, albeit modulated by the current short-run rate of capacity utilisation.

4.5 Money and finance

This chapter has so far focused on real sector processes of growth, distribution, investment and saving while largely omitting considerations of the monetary and financial sector. In part, this reflects the particular historical evolution of the literature under discussion which, as previously noted, proceeded for a long period without any significant attempt to integrate monetary factors into the analysis.

However, by examining the relationships between such real-sector variables, wa are able to analyse the logic of the interaction between investment and saving decisions, and the resulting outcomes, in isolation from monetary and financial considerations. This interaction between on the one hand, saving and investment decisions, and on the other, outcomes in terms of distribution and accumulation, serves to determine the net flow position of each sector—the set of "net financial balances" of the system. The key task that remains is thus to show how these balances are financed, and how the financing of these balances may impose restrictions that alter the conclusions derived using pure real-sector systems.

In the simplest possible case—that in which the government and foreign sectors are assumed away, and workers consume their entire income—the well-known result is that firms' profits are exactly equal to capitalist expenditure on investment and consumption. Thus the net financial balance of each of the two sectors is zero: income is equal to expenditure.

In such a system, the saving and expenditure decisions of capitalists—which uniquely determine the equilibrium rates of accumulation and profits—are made in apparent isolation of any consideration of the constraints imposed on capitalists by the availability of the finance required to cover those expenditures, or of the distributional consequences of such financing.

What is less immediately obvious is the fact that, in such systems, these expenditure decisions are also assumed to be made without reference to the levels—or *valuations*—of stocks that have accumulated as a consequence of previous decisions, other than the stock of physical capital. While the stock of capital enters indirectly into the decision-making process as a determinant of the rate of rate of profit, the influence of *financial* stocks (both assets and liabilities) is neglected. In reality, these financial stocks will affect expenditure decisions in a number of ways.

Firstly, stocks of liquid financial assets held by firms as the result of profits realised in previous periods will provide a potential source of investment finance. (Since some proportion of investment expenditures will return to firms in the form of profits each period, which are then reinvested, we may consider the liquid assets such as bank deposits that thus circulate within the firm sector as a type of "revolving fund of finance" in Keynes' term (1937a)). These stocks may also serve as collateral for borrowing, thus providing the security which will enable firms to increase their level of bank-financed expenditures. Further, changes in the valuation of such stocks may also influence the expenditure decisions of households and firms. For example, increased financial wealth due to a rise in the valuation of financial assets may serve to stimulate consumption on the part of all holders of those assets—despite the fact that these paper gains would disappear in the event that all holders of such assets attempted to realise their capital gains.

The inclusion of such stocks will also alter the distribution of income from that which would be predicted by pure real-sector models, both by setting up income streams such as dividend and interest payments, and through capital gains as the value of financial stocks changes over time. In turn, these income streams—or expectations of them—will affect both the saving and portfolio decisions of the holders of financial assets.

The observation that, over the long period, the relative volumes of stocks and flows will tend to remain within the boundaries of certain "normal" ranges—and that when they do diverge from these values they will eventually revert, often

in a disorderly fashion—was a central assertion of the "New Cambridge" school. These stock-flow norms are seen as "crucial to determining how actual economic systems work" (Godley & Cripps, 1983, p. 43) In particular, the Cambridge group economists argued that the private sector financial balance (or net acquisition of financial assets, NAFA), tended to remain a constant proportion of income. This proposition came to be referred to as the "New Cambridge equation". (Maloney, 2012)

The significance of all this is that, once financial and monetary sectors are included into growth models, the effects of portfolio decisions and wealth effects on firm financing positions—and thus on investment and aggregate demand—give rise to the potential for firms to face constraints in the level of investment they are able to undertake.

As Lavoie puts it, "the issue is whether firms are truly free to accumulate as they wish, whatever the saving rate of households." (1998) Lavoie is referring to Joan Robinson's assertion that the Cambridge growth models "are designed to project into the long period the central thesis of the General Theory, that firms are free, within wide limits, to accumulate as they please and that the rate of saving of the economy as a whole accommodates itself to the rate of investment that they decree." (1962, p. 82–3).

As discussed in previous sections, this question of how to integrate real-sector models of growth and distribution (that do not rely on the neo-classical aggregate production function) with rigorous monetary and financial theory failed to be convincingly addressed by Post-Keynesian economists for a long period of time. As a result, the Cambridge growth models fell into obscurity and lay almost entirely ignored for several decades. This changed when these models reappeared around the turn of the century after being rehabilitated, first in Lavoie (1998) and subsequently in Lavoie & Godley (2001).

In Lavoie's first attempt at rehabilitation of the neo-Pasinetti model (1998), the problem of portfolio choice is not tackled, so that Davidson's complaint about the lack of money in the model remains unaddressed. Nonetheless, Lavoie modifies the model to incorporate both changes in capacity utilisation and endogenous determination of the rate of accumulation through explicit specification of an investment function.

The relaxation of the assumption of a given rate of capacity utilisation allows for the incorporation into the neo-Pasinetti model of an alternative mechanism by which the level of saving adjusts to accommodate desired investment. By

combining the Kaleckian growth model with the neo-Pasinetti adjustment mechanism, the model is able to retain the "paradox of costs" and "paradox of thrift" while including an explicit account of the way in which the adjustment of saving to the desired investment of firms takes place via the revaluation of financial assets.

The key feature of the neo-Pasinetti model—that the rate of profit depends only upon the rate of growth and the saving propensity of capitalists or profit retention ratio—implies that, theoretically, the firm sector as a whole may set any rate of accumulation it chooses, and this will be financed by a combination of retained earnings and the saving of households, regardless of the propensity to save of households.

The adjustment of household saving, such that it is always equal to the difference between retained earnings and desired accumulation, takes place through changes in the valuation of financial securities. In the case of an increase in accumulation, the additional issuance of securities by firms to finance this investment results in a fall in the valuation of equities, thus reducing consumption out of capital gains and increasing household saving. Any increase in the propensity to save of households—rather than leading to a reduction in output because of reduced aggregate demand—is offset by changes in consumption out of capital gains.

In Kaldor's initial version of the model, the rate of capacity utilisation is fixed, thus any rise in the rate of profit must necessarily be the result of a redistribution of income from wages to profits through a rise in the mark-up. In Lavoie's updated version, the mark-up is assumed to remain constant, while changes to the rate of profit take place through changes to the rate of capacity utilisation as in the Kaleckian model in Section 4.4.

In altering the way that the rate of profit adjusts to output growth by fixing the price mark-up and allowing the rate of capacity utilisation to vary, Lavoie is able to introduce the potential for an independent investment function into the model. Two possible such specifications of such an investment function are examined in which growth responds positively to either the rate of capacity utilisation or the valuation ratio.

The key result that emerges from a model of this type is that firms are indeed free to accumulate as they wish: investment causes saving. Further, the Kaleckian "paradox of costs" holds, in contrast to the inverse relationship between wages and saving when capacity utilisation is held constant. With variable capacity,

higher rates of accumulation and output are compatible with higher wages, and a lower profit margin but a higher rate of profit. Whether the "paradox of thrift" holds depends on which specification of the investment function is used: with investment a function of the value of financial securities, an increase in household saving results in higher accumulation due to the positive effect on the value of securities. Thus, the paradox of thrift does not hold in the case that firms' investment decisions are influenced by their market capitalisation.

However, despite the progress demonstrated by integrating a variable-capacity Kaleckian growth model with a representation of the stock market, the model remains problematic in the way it deals with the financial system. In particular, the key criticism of the Kaldor's original model remains its validity: all household saving is directed to purchasing stock market assets, so that the price of equities always adjusts to ensure the stock market clears at a price which generates goods market equilibrium at the desired rate of accumulation. The equality between saving and investment is thus achieved by a pure price equilibrium system, thus ruling out the potential effects of liquidity preference, speculative behaviour or balance-sheet management by firms. It is this price-equilibrium mechanism which leads to Kaldor's result that the saving of households has no effect on the rate of profit, and thus on the ability of firms to freely set the rate of accumulation of the system.

These problems are addressed in an updated version of the model presented by Lavoie & Godley (2001). The authors build upon the model put forward in Lavoie (1998) to incorporate the Kaleckian growth model into a fully-specified stock-flow accounting framework with both bank money and equities. Thus, firms' investment may be financed either through bank loans or equities issuance and households allocate savings between money and equities using a Tobin-style portfolio allocation process.

In switching from a continuous-time representation of the economy to a discrete-time formalisation, the effects of changes to the value of stocks are explicitly tracked, by allowing the level of stocks in previous time-periods to enter into behavioural equations. This further results in the possibility of lags being introduced into the model, allowing variables to adjust at differential rates.

A number of results are demonstrated by the updated model, which largely echo those of Lavoie's earlier version: higher real wages result in higher growth (along with a higher firm leverage); whether the paradox of thrift holds depends on the sensitivity of investment to the price of equities; and liquidity preference

does affect real outcomes with an increased willingness to hold equities leading to a higher growth rate. One result in particular stands out in that higher rates of interest lead to higher rates of accumulation. This is the result of interest income flows to households inducing increased consumption which in turn leads to higher output and thus increased investment. This result depends in part however on the assumption that households hold no debt. If mortgages and other forms of consumer debt were to be introduced, the effects of interest would depend on the net position of households and the spread of interest rates on their assets and liabilities.

4.6 Growth in a pure-credit system

4.6.1 Overview

This section brings together the monetary analysis of the previous chapter with the growth theories discussed in the preceding sections of this chapter. This is done by combining the Kaleckian growth model with the pure credit monetary framework used in Chapter 3. This allows for an integrated analysis of the relationships between the real sector processes of saving, investment and growth and the sectoral balances and financial flows that arise out of these processes.

The model is constructed on the basis of the transactions matrix used in Section 3.4, reproduced in Table 4.1 in a slightly modified form. As described in Chapter 3, this matrix gives a simplified account of the complete set of real and financial transactions that take place within the model economy.

It is assumed that one financial asset is available—bank deposits—and this asset is used by households as a means of saving, and by firms as a means of holding liquid assets. Capital investment by firms is financed using a combination of retained earnings and loans obtained from the banking system. In assuming that firms may hold bank deposits, we thus introduce into the model the possibility of firm overcapitalisation—the holding of financial assets by firms in excess of those assets required for productive investment.

Equity financing is not included in the stock-flow framework. It has been ommitted from the current model for several reasons. As previously noted, the Kaldorian equity price adjustment mechanism was regarded as unsatisfactory because it resulted in Tobin's q performing a role akin to the rate of interest in neoclassical models, adjusting the desired saving of households to match firms'

planned investment. Although Lavoie and Godley improve on Kaldor's model by introducing portfolio choice for households, the valuation ratio, q, still performs the role of a market-clearing equilibrium price. Thus there is no possibility of the type of speculative behaviour or intra-sectoral transactions of the kind discussed in Section 3.5. Finally, since the intended purpose of the model is the analysis of the Chinese economy, the use of a pure credit bank-based model is appropriate: it will be shown in later chapters that equity finance provides only a marginal source of investment funds in China.

4.6.2 Model equations

This section defines the equations of the model. The full set of equations of the model are presented, and briefly discussed. The specification of a number of the equations is then analysed in more detail in the context of the model simulations.

Supply side

Firstly, it is assumed that the model represents an economy with excess capacity, such that additional demand for both consumption and capital goods can be accommodated. We thus assume that the supply of consumption goods, C_S and of investment goods, I_S adjust to match their respective demands, C_D and I_D.

$$C_S = C_D \tag{4.24}$$

$$I_S = I_D \tag{4.25}$$

Likewise, the existence of a reserve army of labour is assumed, such that all labour demanded is forthcoming.

$$N_S = N_D \tag{4.26}$$

National accounting identities

A number of identities are implied by the transactions matrix and standard national accounting. Firstly, output is equal to consumption plus investment: the GDP by expenditure identity

$$Y \equiv C_S + I_S \tag{4.27}$$

	Households	Firms (cur)	Firms (cap)	Banks	Total
Consumption	$-C$	$+C$			0
Investment		$+I$	$-I$		0
GDP		$[Y]$			
Wages	$+W$	$-W$			0
Profits	F_D	$-F$	$+F_R$		0
Deposit interest	$+r_D \cdot D_{H(-1)}$	$+r_D \cdot D_{F(-1)}$		$-r_D \cdot D_{(-1)}$	0
Loan interest		$-r_L \cdot L_{(-1)}$		$+r_L \cdot L_{(-1)}$	0
Net fin. balance	$[S_H]$	$[0]$	$[S_f - I]$	$[0]$	
Change in Deposits	$-\Delta D_H$		$-\Delta D_F$	$+\Delta D$	0
Change in Loans			$+\Delta L$	$-\Delta L$	0
Total	0	0	0	0	0

Table 4.1 – Transactions flow matrix.

Since output is equal to income, output is also equal to total wage payments, WB plus gross profits, F_T: the GDP by income identity.

$$Y \equiv WB + F_t \tag{4.28}$$

Since it is assumed that firms distribute some proportion of profits, total gross profits must be first be used to cover net interest payments, and then divided between retained earnings F_R, and distributed profits F_D.

Since all borrowing originates in the firm sector which also is assumed to hold some level of deposits as a liquid reserve, total net interest payments is equal to the interest paid on loans by firms, less interest received on firms' deposits. This is given by the rate of interest on loans, r_L, multiplied by the level of outstanding loans in the previous period, $L_{(-1)}$, minus the rate of interest on deposits, r_D multiplied by the level of deposits held by firms in the previous period, $D_{F(-1)}$.

$$F_t \equiv F_R + F_D + (r_L.L_{(-1)} - r_D.D_{F(-1)}) \tag{4.29}$$

Turning to the labour market, labour productivity, assumed to be exogenous, is identically equal to output divided by employment,

$$\rho \equiv Y/N_S \tag{4.30}$$

and the wage bill is equal to the money wage multiplied by employment

$$WB \equiv w \cdot N_S \tag{4.31}$$

In the household sector, demand for consumption must equal household income less saving. Since household income is comprised of wages, interest payments, and distributed profits, consumption demand is given by the following identity—this may be read directly from the household column of the transactions flow matrix.

$$C_D \equiv WB + r_{D(-1)} \cdot D_{H(-1)} + F_D - S_H \tag{4.32}$$

Households

Next is the equation which determines the household saving decision. Household income is divided into three categories: wages, interest and distributed profits of firms', with a separate propensity to save out of each. Since households (in

the absence of perfect foresight) are unable to know the exact levels of these income streams in the current period, we assume that households make their saving decision based on the income received in the previous period. Household saving is thus given by the following behavioural equation:

$$S_H = \alpha_w \cdot WB + \alpha_i(r_D \cdot D_{H(-1)}) + \alpha_f F_D \tag{4.33}$$

Since households have no choice of assets in which to hold their savings, household saving must be all accrue as bank deposits.

$$\Delta D_H = S_H \tag{4.34}$$

Output, pricing and profits

Next are a number definitions relating to output levels, pricing and profit rates. These are the equations that make up the Kaleckian growth model described in the previous section. Firstly, the rate of profit, r, is equal to total profits divided by the capital stock,

$$r = F_T/K \tag{4.35}$$

capacity utilisation, u, is the ratio of output Y to full-capacity output Y_F,

$$u = Y/Y_F \tag{4.36}$$

and the capital to full-capacity output ratio v, is assumed to be exogenous and determines the maximum output that can be produced with a given capital stock.

$$v = Y_F/K \tag{4.37}$$

Assuming that firms engage in mark-up pricing with the mark-up, τ exogenously given, in the absence of overhead costs, the gross profit margin m will be given by,

$$m = \frac{\tau}{1+\tau} \tag{4.38}$$

Total profits is thus given by the mark-up multiplied by the level of output,

$$F_T = m \cdot Y \tag{4.39}$$

Firms' identities and investment decision

Next, the identities implied by the firm sector's aggregated balance sheet, and equations describing firms' sector behaviour are introduced.

The proportion of earnings retained is given by a parameter λ, equivalent to Kaldor and Pasinetti's "savings propensity of capitalists".

$$F_R = \lambda F_T \tag{4.40}$$

Now the factors that determine firms' demand for capital investment are considered. The absolute level of investment demand in growth terms, as a proportion of the previous level of the capital stock, can be written as follows,

$$I_D = g^I \cdot K_{(-1)} \tag{4.41}$$

The desired rate of growth of the capital stock is given by the investment equation of the system. As discussed above, this is one of the more controversial elements of any growth model, with the form taken by the equation one of the key determinants of the overall behaviour of the system. As a starting point, the investment equation from the canonical Kaleckian growth model is used. As was the case for the household saving equation, it is assumed that the decision is made upon the basis of realised profits and capacity utilisation in the previous period.

$$g^I = \gamma + \gamma_r r_{(-1)} + \gamma_u u_{(-1)} \tag{4.42}$$

Assuming away capital depreciation, the change in the capital stock will be equal to the supply of capital goods.

$$\Delta K = I_S \tag{4.43}$$

Next is the identity imposed by the flow budget constraint of the firm sector: the sum of the column of the capital account of the firm in the transactions flow matrix. This identity expresses the equality between any increase in demand for bank loans from the firms sector and the sum of new investment that cannot be funded out of retained earnings, plus any increase in desired holdings of liquid assets.

$$\Delta L_D \equiv (I_D - F_R) + \Delta D_F \tag{4.44}$$

What remains is to determine the demand for banks deposits by the firm sector.

As a first approximation, it is assumed that firms wish to hold some proportion of current spending liabilities in the form of liquid assets. The spending commitments of the firms sector, LB, are defined as the sum of wage payments and net interest payments,

$$LB \equiv WB + (r_L \cdot L_{(-1)} - r_D \cdot D_{F(-1)}) \tag{4.45}$$

Then it is assumed that firms aim to hold a proportion θ of their previous-period spending commitments as liquid assets, in this case bank deposits. When firms find that they are holding a volume of deposits of a greater or lesser amount than that desired, they will demand a new level of bank deposits that such that their liquidity position will increase or decrease by a fraction β of the difference between the current and desired balances. Firms thus constantly adjust their holding of bank deposits in an attempt to maintain the desired liquidity ratio.

$$\Delta D_F = \beta(D_F - \theta LB_{(-1)}) \tag{4.46}$$

Money and Credit

The model is completed by specifying the identities implied by the balance sheet of the banking sector, and the assumed behaviour of banks. Since the assumption is initially made that banks passively accommodate all demand for loans, hold no capital, and do not impose a spread between lending and borrowing rates of interest, this section of the model is currently very simple. First, it is assumed that banks accommodate all demands for loans.

$$\Delta L_S = \Delta L_D \tag{4.47}$$

Given that loans and deposits are the only financial instruments, the banks' balance sheet identity required simply that any change in loans must be matched by a change in deposits

$$\Delta L_S = \Delta D_S \tag{4.48}$$

There is a zero spread between the loan and deposit rates of interest,

$$r_D = r_L \tag{4.49}$$

And finally we assume an exogenous rate of interest on loans:

$$r_L = \bar{r}_L \tag{4.50}$$

The banking system is thus initially specified as an "inactive" sector which passively intermediates between the firm and household sectors. However, the current specification nonetheless allows for the incorporation of a money rate of interest into our analysis which is determined entirely independently of the rate of return on capital.

The stock-flow consistent accounting of the model ensures that the final equation of the model is redundant. This is the identity which expresses the equality between changes in the supply and demand deposits.

$$\Delta D_H + \Delta D_F = \Delta D \tag{4.51}$$

This equation must be dropped in order that the system is not over-determined. Likewise, the identity that saving must equal investment,

$$g^S = (F_R + S_H)/K_{(-1)} = g^I \tag{4.52}$$

is not required, but will be found to be satisfied when the model is simulated.

4.6.3 Analysis using simulations

Household saving

The analysis proceeds by using numerical simulations to examine the dynamic behaviour of the model. The first simulation will examine the effect of a change in the saving behaviour of households. This will done by altering the parameters of household saving function while simulating the model.

First, values must be selected for a number of other parameters: the capital to full-capacity output ratio, v, the mark-up, τ, the saving propensity of capitalists, λ and the parameters of the investment function, γ, γ_u and γ_r. While the model is not intended to produce empirically accurate projections, an attempt will be made to use values that are feasible for the Chinese economy. A number of attempts have been made to calculate the capital-output ratio of the Chinese economy,[13], with estimates ranging from around 1.0 to around 2.0, although some

[13]Eg. Bai et al. (2006), Geng & N'Diaye (2012), Sun et al. (2011)

have claimed a value as high as 4.0 (REITI, 2012).[14] For the simulations carried out here a value of 2.8 for the capital-*full-capacity* output ratio is assumed. The actual capital-output ratio will be determined by the model since it is assumed that the economy to be operating at less than full capacity.[15]

A mark-up of 80 percent is assumed. Initially it is assumed that households have an equal propensity to save of 0.25 percent out of wage income, interest payments and distributed profits.[16] Note that by including a specific parameter for the propensity to save out of distributed profits into our model, we bring out into the open the distinction between the decision made by firms on the level of earnings to distribute, and the decisions made by households on whether or not to consume those distributed earnings. This allows us to examine the case, for instance, in which all distributed profits are saved, and thus end up being returned to firms in the form of loans.

With such a configuration of parameters, and assuming initially a zero rate of interest, the steady state of the model is one in which a growth rate of 11.7 percent is achieved by a rate of investment in output of 40 percent and a gross profit margin (and thus profit share in national income) of 44 percent. Defining the leverage ratio as the proportion of total capital expenditure financed by bank loans, a leverage ratio of 44 percent is generated. Thus, around 44 percent of the capital stock is indirectly 'owned' by households.

In order to analyse the effect of changes in the propensity to save of households, the model is simulated starting from the steady state and the propensity to save out of wage income is increased from 25 percent to 27 percent. The resulting trajectories of the key variables of the model are shown in graphically in Figures 4.1–4.5

The effect on growth of the increase in the propensity to save out of wage

[14]The simple rule-of-thumb calculation method calculation for the *incremental* capital-output ratio is to divide the share of investment in output by the rate of growth. Taking the share in output of investment as 40 percent and the rate of growth as 10 percent, this gives an ICOR of 4 for China.

[15]The behaviour of the model with respect to the capital-output ratio is somewhat counter-intuitive. In a full-employment long-run growth model, a higher capital-output ratio (or, to be more precise, a higher *incremental* capital-output ratio), will result a lower rate of output growth, *ceteris paribus*. In the variable-capacity model presented here, a higher capital-output ratio results in higher steady-state long run growth, because a higher rate of capacity utilisation, and thus a higher rate of profit and growth, is required for equilibrium between the 'aggregate demand' and 'profits-cost' schedules.

[16]Although we have not incorporated a stock-market in our model, this does not preclude the distribution of profits—in the case of state-owned corporations, distributed profits will accrue to the state budget, and in the case of privately-owned corporations, profits may be distributed among the owners of those firms.

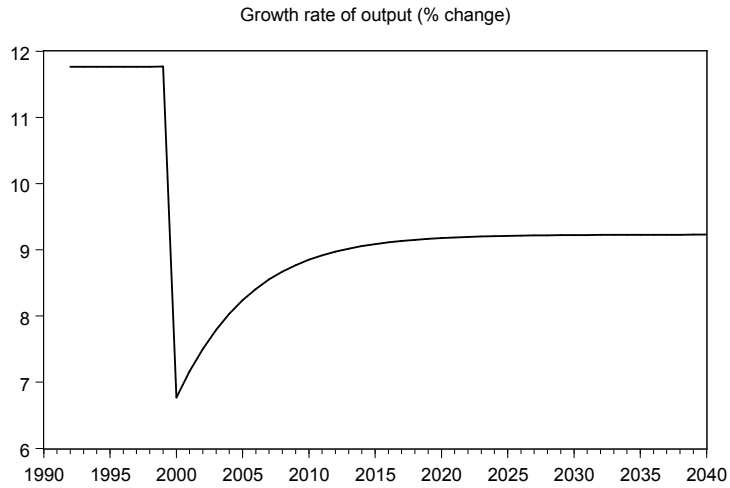


Figure 4.1 – Rate of growth

income is shown in Figure 4.1. The reduction in aggregate demand that results from reduced household demand for consumption causes a reduction in the rate of growth. The initial sharp drop in growth that results from this fall in aggregate demand causes households' wage income to drop, and the household sector as whole thus finds that they have saved a greater proportion of their wage income than they had intended to. In each subsequent period, households thus reduce their saving, leading to a gradual increase in the rate of growth until household saving as a proportion of wages converges to the desired value.

The drop in output caused by the fall in consumption demand is reinforced by a drop in the growth of investment demand. This fall in investment demand is in turn caused by the falls in capacity utilisation and in the rate of profit that result from the fall in consumption demand. The trajectory of the rate of profit and rate of capacity utilisation are shown in Figures 4.2 and 4.3

The change in the distribution of total saving between households and firms is reflected in the monetary side of the model. The increase in the proportion of wages saved, and the drop in total output combine to produce an increase in the ratio of past expenditures on capital to GDP, and an increase in the ratio of household deposits to GDP, as shown in Figure 4.4. However, household deposits rise in a proportionally greater amount than the capital-output ratio, implying that households 'own' a greater proportion of capital than they previously did.

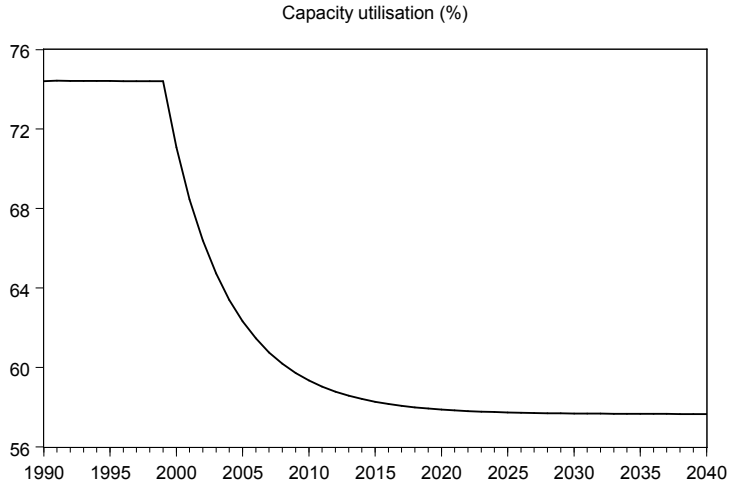


Figure 4.2 – Increase in saving propensity out of wages: capacity utilisation

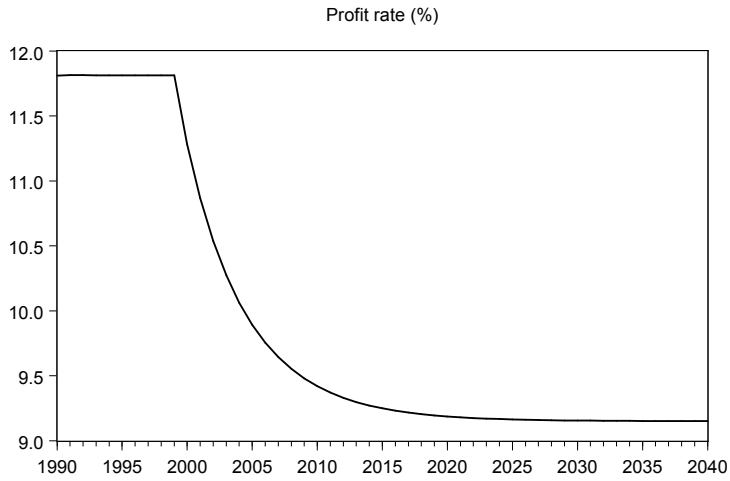


Figure 4.3 – Increase in saving propensity out of wages: rate of profit

Since it has so far been assumed that loans are the only asset available to banks, the volume of loans and deposits must be equal. Thus the leverage ratio of firms must increase, due to the increase in household saving, as is shown in Figure 4.5

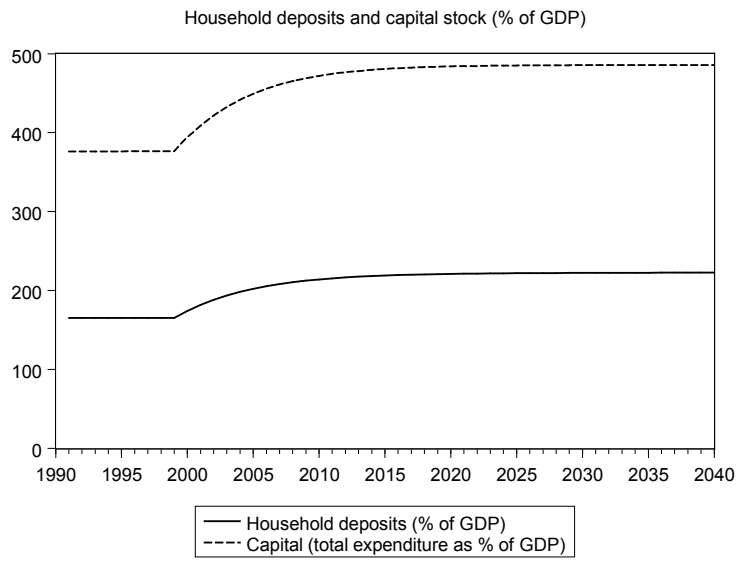


Figure 4.4 – Increase in saving propensity out of wages: capital stock and household deposits as a proportion of GDP

The model generates quite different results to those of Pasinetti and Kaldor, and also to those models such as Lavoie & Godley (2001) and dos Santos (2005) in which the stock market serves as a mechanism for adjusting household saving to the desired investment decisions of firms. In the current configuration of the model, the propensity to save of households affects both the rate of profit and the rate of growth. The only variable which is unaffected by changes in the propensity to save of households is the functional distribution of income, because of the assumption of a fixed price mark-up over costs.

In particular, the financial position of the firm sector is affected by the saving decisions of the household sector. In Steindl's (1952) analysis, a rise in the propensity to consume of households results in higher leverage and "forced indebtedness" of the firm sector. The results of the current model are thus compatible with Steindl's analysis of the relationship between the saving behaviour of households and the leverage of the firm sector.

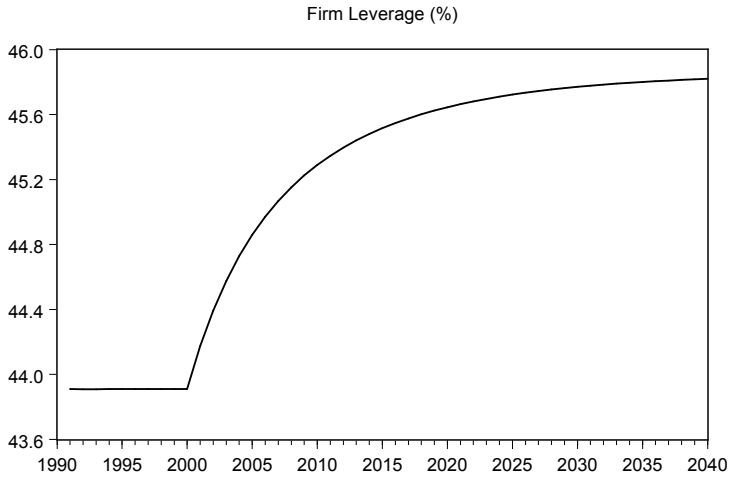


Figure 4.5 – Increase in saving propensity out of wages: firms' sector leverage

Thus far in the analysis the role of interest payments has been ignored. Changes to households' saving behaviour have affected aggregate demand, output, and the leverage of firms, but not the distribution of income. As in Kaldor's 1956 model, it is as if "workers' savings are always totally transferred as a gift to capitalists."(Pasinetti, 1962). This is no longer the case once interest payments are introduced into the analysis. The analysis proceeds by considering the behaviour of the model with a positive rate of interest on deposits and loans. Initially, the possibility of banks' profits is assumed away, implying that the rate of interest on deposits and loans is equal. However, this interest rate is explicitly specified as the rate of interest *on money*. There is thus no reason to assume, as does Pasinetti, the existence of some mechanism which brings this rate of interest into equality with the rate of profit (thus neutralising the saving decision of workers with respect to the distribution of income).

In the models of Lavoie & Godley (2001) and Godley & Lavoie (2007), one apparently paradoxical result is that of a positive relationship between the rate of interest on one hand, and growth and output on the other. This is the result of increases in consumption demand from households due to higher income in the form of interest payments. Similarly, in some configurations of the models, the paradox of thrift is reversed: the initial drop in aggregate demand from increased household saving is eventually reversed as higher household saving results in

increased income in the form of interest payments and thus higher consumption demand. These results are due in part to the assumption of a single propensity to consume out of all type of income. In the current analysis, the more complex situation in which households hold different propensities to consume out of different types of income is considered, thus allowing for a partial separation of the household sector into workers and rentiers.

In order to analyse the effect of the rate of interest, the current model is first re-calibrated such that it generates steady-state growth with a rate of interest on deposits and loans of five percent with two different sets of parameters for the saving-propensity of households. The model is then used to generate simulations over a period of time in which the rate of interest is cut to three percent. The model is first simulated with an equal propensity to save out of all types of income—wages, interest and distributed profits. We subsequently assume a low propensity to save out of wages, a propensity to save out of interest payments of one, and a propensity to save out of distributed profits of zero, and repeat the simulations. The final assumption of zero saving from distributed profits may initially appear odd, but this decision regarding saving out of retained earnings is subsequent to the decision on the level of earnings to retain. Thus, capitalists have already decided on the share of profits to retain, so that the assumption that the remainder is consumed may be reasonable in certain circumstances.

The results of the simulation with uniform saving propensities are shown in Figure 4.6 and the results obtained with income-specific saving propensities shown in Figure 4.7

In the first case (Figure 4.6), the decrease in household incomes due to lower interest payments causes a reduction in consumption demand, while the improved position of the firm sector has no effect on investment demand since firms are assumed to form their investment decision on the basis of gross profits (before interest payments), rather than net profits, or "operating surplus". Thus there is a reduction in aggregate demand, leading to a fall in the rate of growth and capacity utilisation, while firms' aggregate leverage also falls (although from an initially much lower level, due to the low propensity to save out of wages). In the second case, the drop in the rate of interest also causes a reduction in the leverage of the firm sector, but since we have assumed a higher propensity to save out of interest income than other types of income, the reduction in the proportion of household income in the form of interest payments results in an increase in aggregate demand. Thus, output, profits, and capacity utilisation all increase while

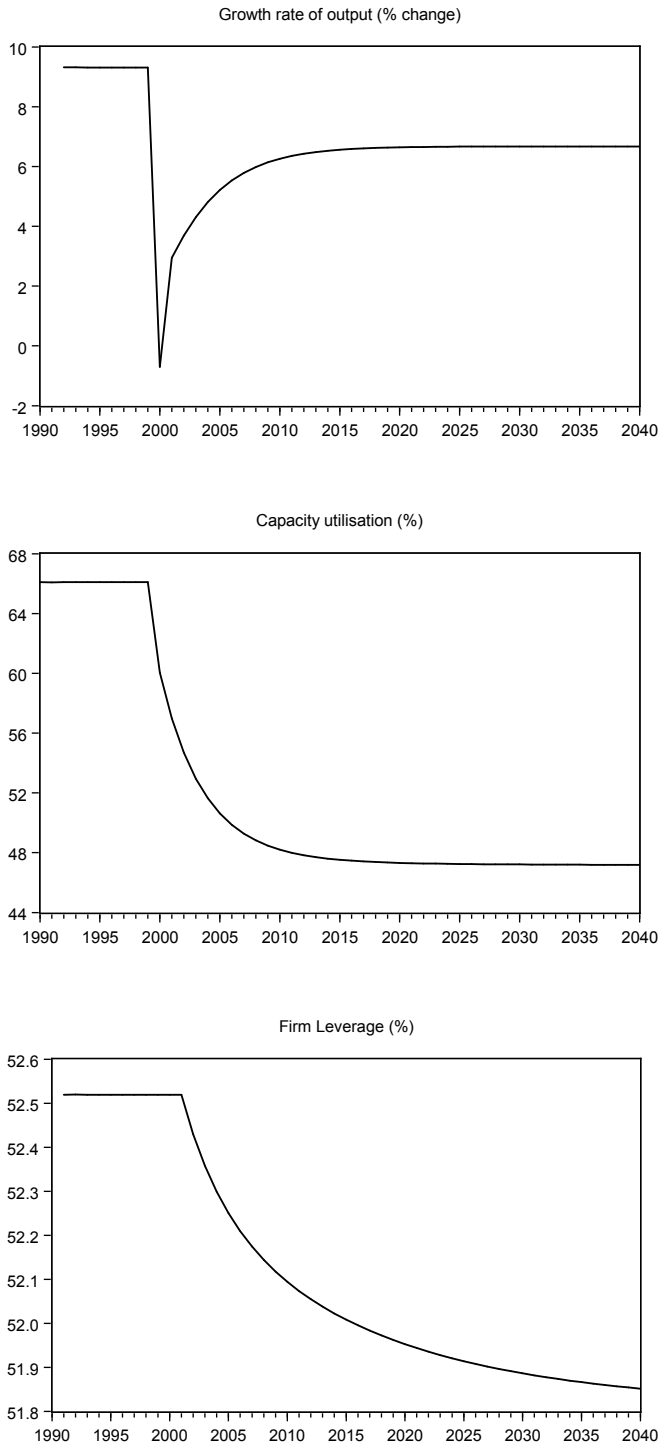


Figure 4.6 – Decrease in the rate of interest: uniform household saving propensity

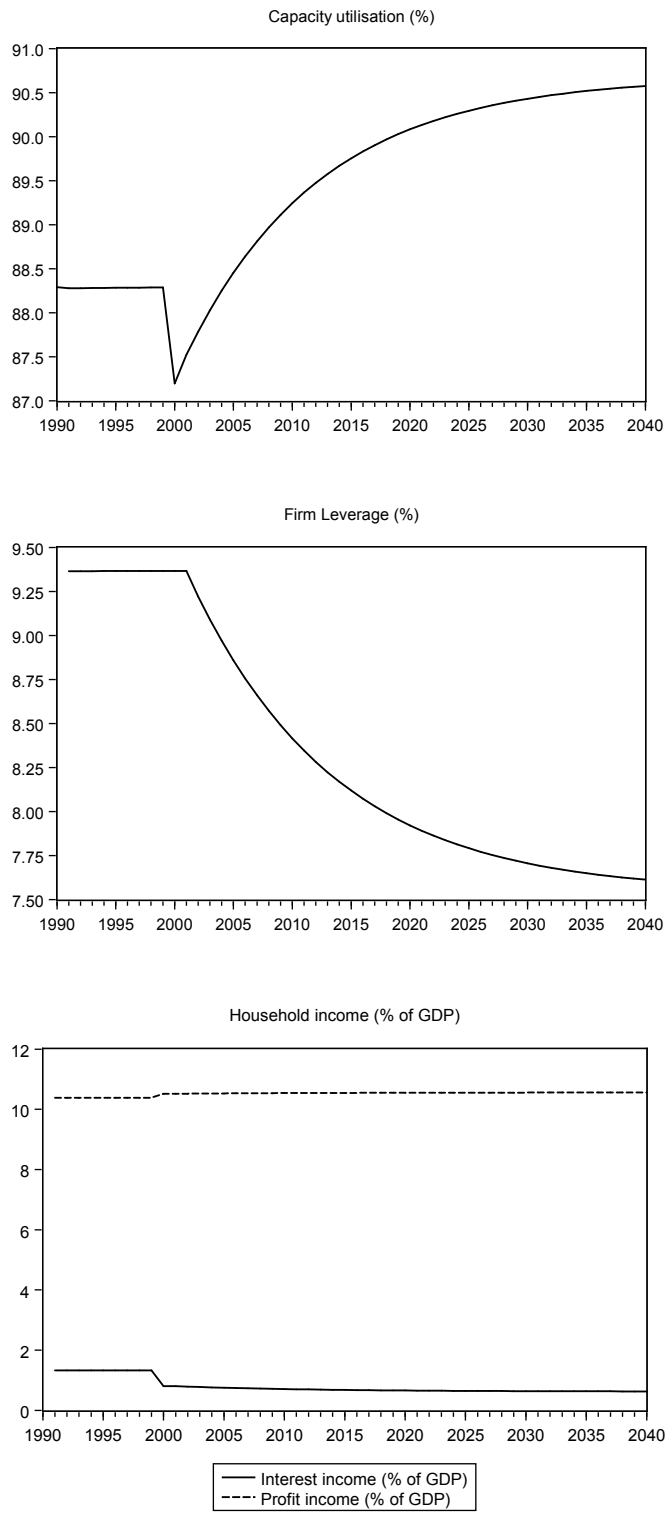


Figure 4.7 – Decrease in the rate of interest: income-specific household saving propensities

firm leverage decreases.

Firms' saving and over-capitalisation

The analysis up until this point has allowed for saving in the firm sector in the form of retained earnings, but the assumption has been that all retained earnings are directed towards investment. All accumulation in the firm sector thus takes place in the form of capital assets.

One of the key innovations of the current approach is now introduced: that of the possibility of firm over-capitalisation. The implications of firm over-capitalisation in a stock-flow consistent system were discussed in detail in Section 3.4. In particular, it was demonstrated that the cost to the firm sector as a whole of maintaining a proportion of retained earnings in the form of liquid assets is given by the margin between borrowing and lending rates on those assets. This innovation is now incorporated into the current model by allowing firms to retain a portion of their earnings in the form of bank deposits.

Equations 4.45 and 4.46 allow for the possibility of firm over-capitalisation in the case that parameters Θ and β take non-negative values. Once potential for firms' to be over-capitalised is introduced into the model, a number of previous definitions require re-examination, in particular that of the leverage ratio of the firms' sector. Whereas this was previously defined as the ratio of loans to capital assets, the updated version defines it more broadly as the ratio of net liabilities to non-liquid assets. Thus the leverage of the firm's sector is now defined as follows:

$$LV = (L_F - D_F)/K \tag{4.53}$$

It is likely that when firms find themselves to be over-leveraged or short on liquidity they attempt to improve their position by cutting back on expenditures. Thus, the Kaleckian investment function is augmented by including additional terms for the leverage of the firm sector and the level of liquidity of the firm sector. We thus replace equation 4.42 with the following:

$$g^I = \gamma + \gamma_r r_{(-1)} + \gamma_u u_{(-1)} + \gamma_{lv} LV_{(-1)} + \gamma_{lq}(D_F - \theta LB_{(-1)}) \tag{4.54}$$

These modifications result in a fully-specified stock-flow consistent macroeconomic model incorporating firm over-capitalisation, in which the firm sector adjusts its expenditure behaviour in response to changes in its leverage and liq-

uidity positions. The behaviour of this model is now analysed.

The first simulation using the augmented investment function examines the effect of an increase in the autonomous element of the firms' investment function, γ. This may be interpreted as in increase in the "animal spirits" of the firms' sector.

Of particular interest is the effect on the financial position of the firm of increased investment expenditure. A number of authors have commented on Minsky's belief that higher growth can only be achieved through an increase in debt-financed investment (Eg. Lavoie & Seccareccia 2001; Toporowski 2010). As a consequence, Minsky believed that higher growth inevitably leads to higher leverage ratios. These authors point out that in forming these conclusions, the implications of Kalecki's famous profit equations appear to have been overlooked by Minsky: "Minsky... seems to be totally unaware of [Kalecki's] profit equations, at least until 1977." (Lavoie & Seccareccia, 2001). [17]

Figures 4.8 and 4.9 show the results of this simulation. Examining Figure 4.8 first, the increase in investment arising as a result of the increase in animal spirits leads to an initially strong increase in the rate of growth which then moderates slightly. At the same time, the rate of profit rises. The most interesting results are shown in the relative proportions of firms' and household's holding of deposits as a proportion of the capital stock. As Figure 4.8 shows, the ratio of loans to past cumulative expenditures on capital increases. However, the ratio of firms' deposits to capital also increases, while household deposits decline slightly as a proportion of capital. The effect on the financial position of the firms' sector is confirmed by Figure 4.9, showing a drop in the leverage ratio of the firm sector. An increase in investment thus leads to lower "gearing" in the current configuration of the model, a result sometimes referred to as the "paradox of debt".

Finally, the evolution of the liquidity position of the firms sector is also shown. Starting from a steady state, there is an initial drop in firm liquidity as increased investment results in a jump in expenditures. Despite the model including the assumption that firms will cut back on expenditures when liquidity is below the desired level, in this case the increased profits that result from the jump in invest-

[17] Even if Minsky was not directly aware of Kalecki's equations, there are indications that he *was* aware of the tension between micro and macro outcomes in his model, as demonstrated by the following quote: "...excess investment leads to a higher than anticipated aggregate income... the improvement of realized profits partially frustrates the planned debt-financing of investments of firms and simultaneously reinforces the willingness of firms and bankers to debt-finance further investment." (Minsky, [1975] 2008, p. 112)

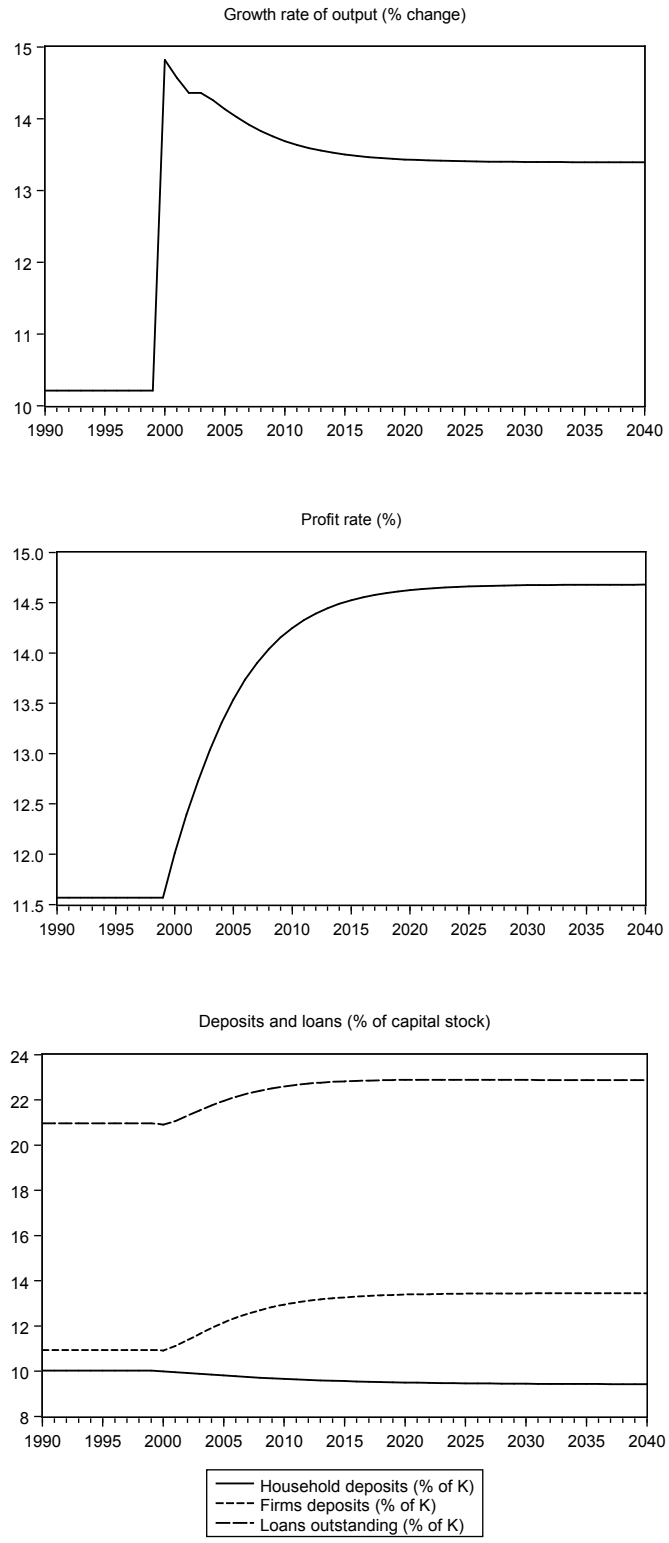


Figure 4.8 – Increase in animal spirits

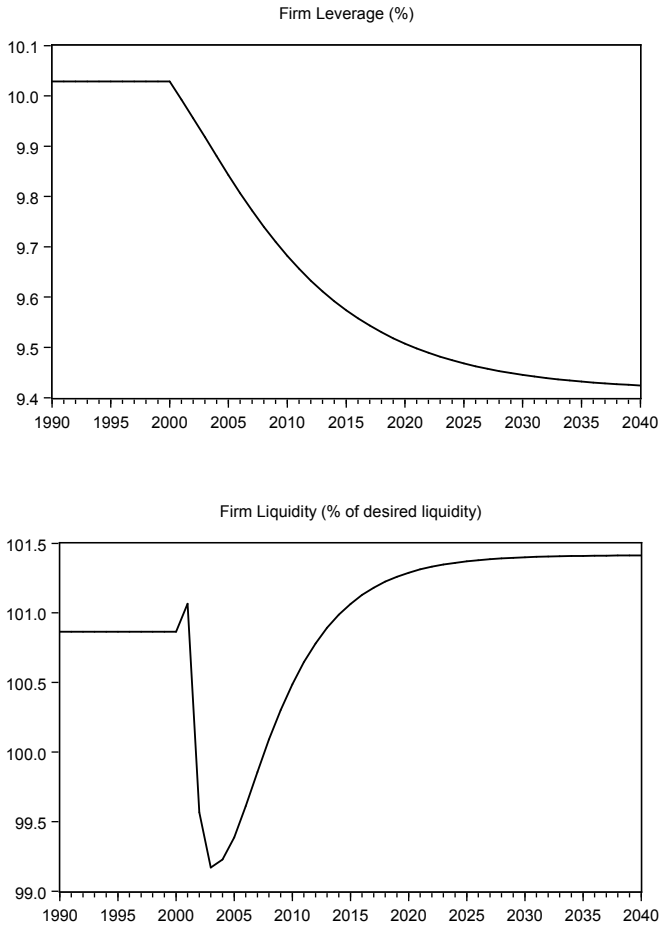


Figure 4.9 – Increase in animal spirits (contd.)

ment more than offset the negative effects of decreased liquidity. Thus, firms are able to recover their liquidity position in subsequent periods while growth and the rate of profit remain above the initial level.

Adjustment of internal accumulation

The model is now used for an analysis of a number of aspects of Steindl's analysis. Steindl's fundamental insight is that the adjustment of saving to a new rate of investment growth will take place via different mechanisms in an oligopolistic market in comparison to the situation in which competitive conditions prevail.

Under either set of market conditions, an initial (exogenous) reduction in the rate of accumulation requires that the growth of saving in the economy as a whole be reduced to an equal rate, since *ex-post*, saving and investment must be equal. Since "outside saving" is assumed to be relatively inelastic, the weight of this adjustment falls disproportionately on "internal accumulation", leading to an inevitable increase in the gearing ratio.

The mechanism by which internal accumulation adjusts to a level compatible with the new rate of accumulation is central to Steindl's analysis. The adjustment of internal accumulation is the result of a fall in the rate of profit, which may arise in one of two ways:

> In considering the effects of a fall in the rate of growth of capital it has rightly been assumed that the internal accumulation of funds will be adjusted to it by a fall in the rate of profit... The fall in the rate of profit will, of course, come about by a reduction of net profit margins... Now the net profit margin can be reduced in two distinct ways: either by a fall in the degree of utilisation of capacity; or else... if gross profit margins are reduced... (p. 122)

Steindl defines a "profit function" which captures the relationship between the gross rate of profit (net of interest payments), the rate of capacity utilisation, u, and capital intensity, k:

$$e = F(u, k) \tag{4.55}$$

This function contains an implicit "parameter" representing the gross mark-up on costs, which in Steindl's formulation is embedded in the functional form of the equation. This profit function is thus essentially identical to the "profits-cost" equation of the Kaleckian growth model:[18]

$$r = \frac{mu}{v} \tag{4.56}$$

Given a profit function of this type, and assuming a fixed degree of capital intensity, a reduction in the rate of profit may either result from of an increase in excess capacity, or through a fall in the gross mark-up. Which of these two effects

[18]Steindl includes overhead labour in his formulation of the profits function, which is abstracted from in the formulation of the Kaleckian model presented here.

prevails is determined by whether the market tends towards an oligopolistic or towards a competitive market structure:

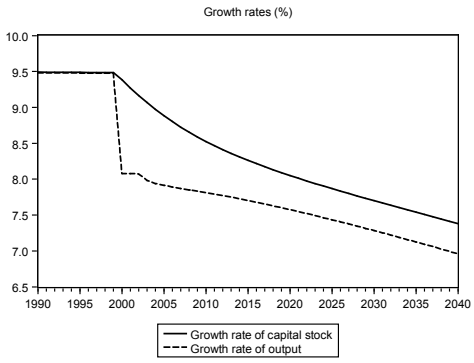
> ... in an industry where squeezing out of competitors is easy, the profit margin at given capacity utilisation is elastic... On the other hand, in an industry which approximates to the oligopolistic type, where the driving out of competitors is difficult, the profit margin at given utilisation is inelastic. (p. 122)

These two cases may be analysed using the current model. This is done by subjecting the model to an exogenous fall in the "autonomous" investment rate. The case of the "competitive" economy is then approximated by assuming that firms react to the reduction in the rate of capacity utilisation (in this case after a period of five years) by reducing the mark-up on costs, and thus the gross margin. We compare this case to the alternative "oligopolistic" case in which firms' gross profit margin is inelastic to the rate of capacity utilisation and thus does not react to the fall in capacity utilisation.[19]

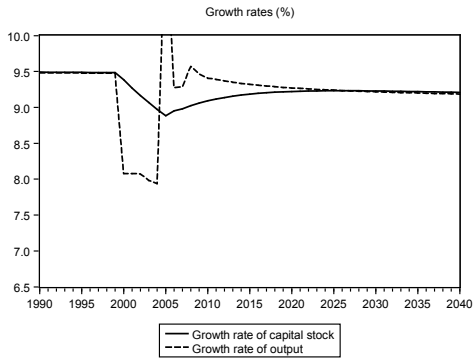
Steindl separates household income into three different income streams: rentiers, dividends and wages. It is argued that the elasticity of saving out of each of these three types of income will be different (p. 115–116). Rentier's income is regarded as the most inelastic of the three, followed by saving out of dividend income. Unlike Kalecki, Steindl does not assume that all wage income is consumed, but argues that saving by "professional people and big salary earners" will be significant and potentially inelastic due to the fact that "savers in these groups are in relatively sheltered positions, and their income is not subject to very great pressure." (p. 117). The specification of saving relationships in the model, such that separate propensities are specified for the saving out of each income stream allows the model to be calibrated to match Steindl's assumptions about the relative propensities to save of each group.

Figure 4.10 shows the reaction of the model to an decrease in the exogenous component of capital accumulation, characterised as an increase in "animal spirits". The left-hand column shows the subsequent behaviour of the system in the case of an oligopolistic market structure wherein the gross margin is completely

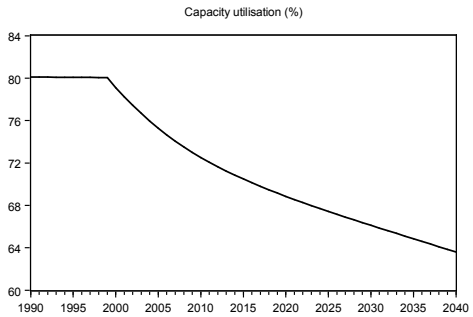
[19] Although the reaction of firms to a rise in excess capacity is "artificially" introduced here, it would be straightforward to alter the model so that firms target a certain maximum level of excess capacity and adjust their mark-up accordingly, thus "endogenising" the key relationship which defines market structure for Steindl.



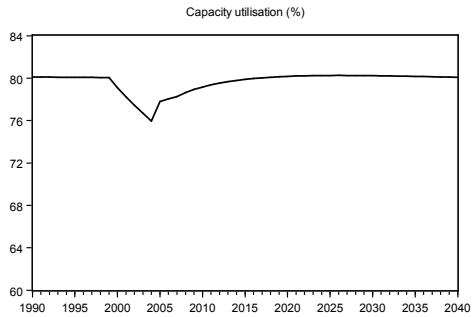
(a) Growth rates: oligopoly



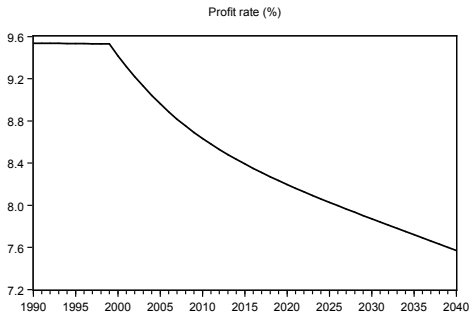
(b) Growth rates: competitive



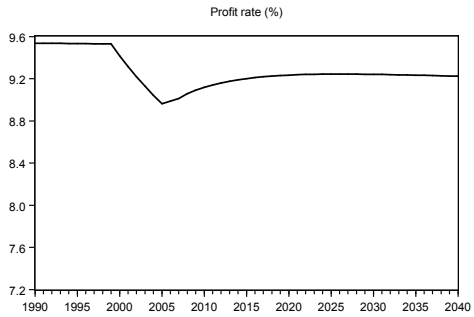
(c) Capacity utilisation: oligopoly



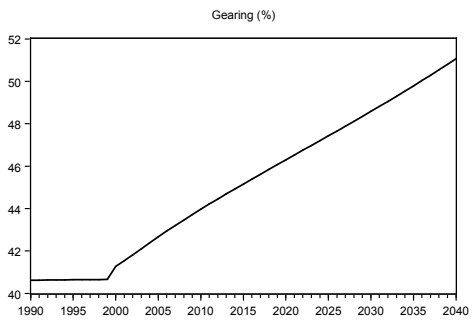
(d) Capacity utilisation: competitive



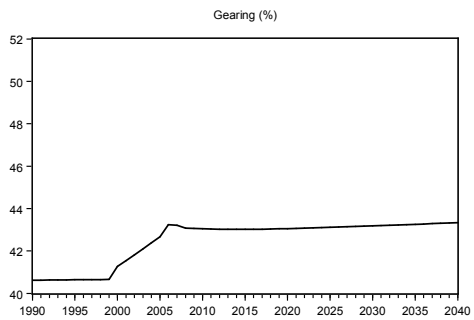
(e) Profit rate: oligopoly



(f) Profit rate: competitive



(g) Gearing ratio: oligopoly



(h) Gearing ratio: competitive

Figure 4.10 – Exogenous reduction in investment in oligopoly and competitive markets.

inelastic to excess capacity. The right-hand column shows the system after an identical shift to the investment function, but in this case it is assumed that subsequently (in the period labelled 2005 although the numbering of the years holds no significance) the gross margin of the firms sector is reduced in reaction to the fall in capacity utilisation.

In both cases, the decrease in the rate of investment initially causes a reduction in aggregate demand, reducing output growth and capacity utilisation. This in turn reduces the rate of profit. The fall in the rate of profit and and the expansion of excess capacity serve to reinforce the drop in accumulation. The relative inelasticity of "outside saving" compared to retained earnings pushes up the gearing ratio of the firm sector.

In the case of the "competitive" market the same initial trajectory is followed, but firms are assumed to react to the increase in excess capacity by adjusting their gross profit margin. This reduction in the profit margin generates an immediate increase in output, by redistributing income to wage earners, who possess a lower propensity to save. As well as increasing aggregate demand, this redistribution of income from the high-saving-propensity firm sector to low-saving-propensity wage earners reduces the rate of "outside saving" thus restoring the balance with the rate of "internal accumulation". Finally, in reducing the gross profit margin, the adjustment of retained earnings to the lower rate of accumulation is able to take place without requiring a reduction in the rate of capacity utilisation.

In the steady state obtained after the system has adjusted to the reduction in the gross profit margin, capacity utilisation returns to its previous rate. The rate of profit is reduced, due to a lower gross margin, as are the rate of accumulation and output growth. The gearing ratio of firms stabilises at a higher, but constant level.

The key distinction between the two cases is thus not only down to the values of the various variables, but also in the relative speed of adjustment to a new steady state. In the case in which profit margins are elastic, the system converges to a new steady state fairly rapidly, whereas in the case of inelastic margins, the self-reinforcing effects of a falling rate of profit and increasing excess capacity result in a much slower rate of convergence. The results of the model thus closely match Steindl's analysis of the adjustment path under conditions of oligopoly:

> The conclusion is that with the pattern of adjustment of the profit margin to be expected in modern times (owing to the predominance of

> oligopoly) a *primary* decline of capital accumulation will—via a reduced degree of capital utilisation—lead with a certain time lag to a further reduction in capital accumulation. This cannot easily lead to an equilibrium. The individual entrepreneur may think that by reducing investment he will cure his excess capacity, but in fact for industry as a whole this strategy has only the effect of making excess capacity even greater. The secondary fall in capital accumulation will again produce a fall in the degree of utilisation, and after a certain time lag this will reduce capital accumulation further. (1952, p. 123)

4.7 The distribution of profits

The analysis and simulations above treat the firms' sector as a single entity. However, this overlooks important implications that arise out of the differences in market structure across industries:

> In reality the growth of oligopoly in a modern economy does not affect all industries equally, and the inelasticity of profit margins at given utilisation will therefore be very different in different industries. (Steindl, 1952)

If the economy is composed of two sectors, an oligopolistic sector in which profit margins are inelastic, and a competitive sector in which margins are elastic, the dynamics of internal accumulation, capacity utilisation and sales growth will differ in each. In particular, increasing concentration in the oligopolistic sector will not be felt only within that sector. The reduction in aggregate demand and capacity utilisation, although arising from increasing concentration in the oligopolistic sector, will feed through into a lower rate of growth in all sectors of the economy.

This change in market structure will induce a reaction in both the competitive and oligopolistic sectors, but an important distinction arises in the different mechanisms by which adjustments to the reduction in aggregate demand take place in each. In the competitive sector, it can be expected that cost-cutting will take place, reducing profit margins and eliminating marginal firms, such that capacity utilisation will tend to remain steady. In contrast, in the oligopolistic sector the inelasticity of profit margins will result in a reduction in the rate of capacity utilisation.

In such a situation, Steindl argues, the drop in the "internal accumulation" of firms which is required to accommodate the reduction in the rate of growth and output will take place disproportionately within the competitive firms sector. Since firms within the competitive sector will reduce mark-ups over costs, the profit margin of this sector as a whole adjust downwards. In turn, the rate of profit in this sector will fall as a result of both reduced sales and reduced margins.

While the oligopolistic sector will also face reduced demand, the relative inelasticity of mark-ups will prevent a similar accommodating fall in the profit margin. Thus, the tendency towards stagnation that accompanies the increasing concentration in the oligopolistic sector is accompanied by a shift in the share of total profits towards the oligopolistic sector. As a result there will be an accompanying divergence of the relative indebtedness of the two sectors, such that the gearing ratio of the competitive sector will rise relative to that of the oligopolistic sector.

It is possible however to imagine an inversion of the above dynamics. This could arise if, for example, a significant share of the firms sector was to operate in a way unlike that predicted either by the theory of competition or monopoly. In particular, if a portion of the firms sector was strongly under the influence of the government—such that the government could determine mark-up and investment behaviour—this bloc could exert a strong expansionary influence on the dynamics of growth, profits and distribution.

This sector—despite having the monopoly power to impose significant mark-ups—could operate such that mark-ups were at or below those levels found in the competitive sector. Further, if the investment decisions of this sector were inelastic with respect to the rate of excess capacity utilisation, the investment spending of this sector would serve as a backstop against contraction.

In Steindl's analysis, given a reduction in economic growth, the consequent stagnation arises from the inelasticity of profit margins and the sensitivity to excess capacity in the cartelised sector. If the "state-cartel" sector were to respond to a fall in growth not by scaling back investment expenditures, but by increasing them, the consequent effects on the relative profits of the firms sectors would be the opposite to that described by Steindl—the analysis of the "maldistribution of profits" would have to be reversed.

In such a situation, rather than the investment expenditures of the competitive sector accumulating as profits within the cartelised sector, the investment expenditures of the state-cartel would accrue as profits in the competitive sector. If the investment of this competitive sector were sensitive to profits, this could in

turn spur further investment on the part of the competitive firms.

The effects on the aggregate balance sheets of the two sectors would likewise be reversed. If the state-cartel were to expand investment in the face of reduced aggregate demand—for example as a result of higher household saving or a drop in export demand—it would need to finance these expenditures. Assuming that this sector had good lines of credit with the banking system, such expenditures could be financed by an expansion of bank credit. Some portion of the additional deposits created would accumulate as saving in the household sector. Of the new deposits which remained within circulation in the firms sector, a disproportionate amount would accrue as profits to private firms. In the limiting case in which households consume their entire income (and assuming a closed system), the increase in the deposits of the firms sector at the aggregate level would be equal to the increase in loans. This would not imply, however, that the increase of loans in each of the private and the state-cartel sectors would be hedged by an equal increase in deposits: the increase in deposits in the private sector would be greater than that in the state-cartel sector—while the opposite would be true of bank loans.

The end result of loan-financed investment by the state-cartel sector being used as an instrument to maintain the level of growth in the face of decreasing aggregate demand would thus be increased gearing of the state-cartel sector relative to the private sector. Whether the absolute gearing ratio of the private sector were higher or lower would depend on the parameters of the system. The expenditures of the state-cartel system would thus operate in a similar way to deficit expenditure by the government. However, the financial outcomes would differ. In the case of deficit spending, if effective in increasing the level of growth the financial position of the government would tend to improve automatically as output increases, leading to higher tax revenues and lower social security spending. In the case of a stimulus being implemented through the state-cartel firms, the "maldistribution of profits" in favour of the private sector could be expected to continue even in the face of higher growth, unless the state-cartel sector increased its markup and profit margins and scaled back investment spending.

4.8 Conclusion

This chapter develops an integrated theoretical approach to investment and saving in the context of a pure credit stock-flow consisted framework. An original

interpretation of Steindl's theory of stagnation and "maldistribution of profits" is introduced in which the main assumptions and results of the model are reversed.

The chapter gives an overview of alternatives to the neoclassical approach to growth and income distribution that was discussed in Chapter 2. The theories of the Cambridge UK scholars are discussed and contrasted with those of Steindl and the post Keynesian Kaleckian growth model. The key difference between these two approaches lies with the assumptions about capacity utilisation and employment. The result of the assumption of excess capacity in the latter is that the inverse relationship between the mark-up and the rate of growth that was a feature of Cambridge model can be overcome.

A fully-specified monetary growth model is developed by embedding a modified version of the Kaleckian growth model within the pure credit stock flow system of in Chapter 3. The behaviour of this model is analysed using simulations, allowing the effects on model variables of changes in parameters to be tracked. In particular, it is shown that it is possible for increases in investment expenditures that lead to higher rates of growth to occur in conjunction with reduced leverage of the firms sector and increased holdings of liquid assets by firms.

The use of the stock-flow consistent framework for this model allows for a theoretical analysis which is closely aligned with the data structures used in the empirical work in the remainder of this thesis: since the transactions matrix on which the model is based represents an abstract version of the flow-of-funds accounts—around which the empirical analysis is based—the configurations of flows generated by the model will be qualitatively comparable with the empirical data.

This analysis is extended with reference to Steindl's theory of the distribution of "internal accumulation" of firms. It is argued that if a section of the firms sector operates in such a way that the rates of profit and capacity utilisation do not affect the rate of investment, that those firms will see a reduction in profits and an increase in leverage while the remained of the firms sector will benefit disproportionately from the expenditures of the state-cartel sector. This theoretical system will underpin the analysis of the relative profitability of the state-owned and private firms sectors in the following chapter.

Part II

Evidence

Chapter 5

Credit and banking in China

5.1 Introduction

The current structure of the financial system in China is, above all, the result of the path taken from a centrally planned system towards a market-based economy. The specific institutional forms that have arisen as a result of this transition are representative of a broader truth: financial structures are a function both of their own history, and of the institutional history within which they evolve. However, because modern marginalist theory is able to explain financial structure only in terms of the optimising behaviour of agents operating in imperfect markets, most current empirical analyses of the function and behaviour of financial institutions can be characterised as attempts to isolate those features of financial systems which deviate from some idealised universal structure. A more persuasive view is that "the theory of saving and the rate of interest can—or at any rate should—never be independent of the stage of development of financial institutions" (Chick, 1986).

This chapter presents an overview of the development of China's banking and financial system in the context of the transition from central planning. The analysis shows how the current configuration of the system was formed through a process of financial development over a period of structural change. The gradual pace of transition from the mono-bank system served to minimise the loss of confidence in the banking system that was experienced in other transition economies. As a result, the volume of deposits within the banking system remained relatively stable. Along with strict controls on outward capital movements, this enabled the banking system to undergo the transition from a giro-clearing system for the

planned economy to an set of institutions holding the key feature of a modern banking system: creation of new liquidity through bank lending results in an equivalent increase in the volume of deposits within the system, meaning that loans create deposits.

Although the role and functions of the People's Bank of China have changed considerably over this period, it has retained its central position in the financial system. Following the discussion of the transition period, and the associated structural and regulatory reforms, this chapter provides an overview of current operating procedures used by the People's Bank of China in the implementation of monetary policy. It is demonstrated that the focus of these procedures upon quantitative measures of credit are the result of the evolution from a system in which credit money operated as unit of account in the production of planned quantities of of commodities. At the same time, a quantity-theoretic approach was used to decide the volume of physical currency in circulation for the purposes of consumer transactions demand.

Over the period of transition, the removal of the distinction between these two monetary forms gave rise to a form of credit regulation in which monetary aggregates became the primary targets of control. This approach has been reinforced in recent years by the imposition of a closely-controlled exchange-rate regime, requiring substantial intervention in the foreign exchange markets by the central bank.

These operating procedures are contrasted with the recent New Consensus approach to the conduct of monetary policy which regards such quantitative aspects of monetary control as secondary in importance to the role of interest rates. This New Consensus view underlies much recent analysis of the Chinese financial system, resulting in a tendency to assume that all reforms are geared toward achieving the final goal of a liberalised market-based inflation-targeting regime under a flexible exchange rate. (eg. Laurens & Maino, 2007) This view regards China's banking system as inefficient and outmoded, giving rise to financial repression and misallocation of resources (eg. Lardy, 2008).

The current financial structure may be regarded, instead, as an unstable point along a transitional path in which reforms are implemented by the authorities on a piecemeal basis in response to developments in the wider economic system. By maintaining the ability to influence the allocation and quantity of bank credit granted, in the form of policy loans, and the price of that credit, in the form of centrally-administered interest rates, the state has used the banking system to

play a significant developmental role in generating the high rates of growth experienced over the transition period.

The relationships between the state, the banking system and the investment decisions of firms are complex, but the dynamics of this nexus may be characterised as follows. In maintaining long-term relationships with both the state and the banking system, the Chinese corporate structure shares characteristics with the Japanese and other Eastern economic systems. These non-market "rigidities" would be viewed as leading to inefficiencies under standard marginalist economic theory. The long-term orientation of firms may, however, be conducive to productivity-raising and technology-enhancing effects in the presence of strong aggregate demand. In the context of a credit-investment-led growth path, the role of firms becomes a dual one, since the investment expenditure of firms provides a key component of aggregate demand, while demand-induced manufacturing of investment goods may result to dynamic productivity increases, in line with the Kaldor-Verdoorn analysis. By creating the purchasing power required for these investment outlays, and in allowing for the separation of investment and saving decisions, the banking system plays a key role in the reproduction of this credit-investment-growth process.

This dynamic growth process has thus far been sustained without being derailed by serious crises. While periods of fast credit expansion as a result of policy lending and soft-budget-constraint behaviour on the part of state banks led to inflationary pressures late 1980s and early 1990s, and eventually to the build-up of non-performing loans, inflation was subsequently brought under control without major disruption to growth. Bad assets were gradually shifted from balance sheets, using public money to cover much of the costs of the associated recapitalisation of banks (Ma, 2006). Moreover, the separation of banking and capital markets, along with the underdevelopment of the non-bank financial system have so far precluded serious speculative financial crises of the type experienced in more financial advanced economies. Nonetheless, the fact that China has so far avoided financial crisis is viewed, from the point of view of most mainstream economists as a "no more than an accidental outcome" (Ju & Lo, 2012, p. 385)

While the current institutional framework, in the form of the state-bank-firm nexus, has avoided major systemic crises, associated with the transition from central planning to a more liberalised market-based banking and financial system is a process of endogenous financial development in which privately-generated credit claims come to represent a rising share of total credit. This phenomenon is

illustrated by the growing role of informal and unregulated financial intermediation (Chu et al., 2010; Tsai, 2002). The diminishing share of output accounted for by the large state-owned organisations that receive the bulk of bank credit, and the increasing significance of retained earnings in the funding of investment will make control of monetary aggregates increasingly difficult. Thus, with the continued implementation of liberalisation reforms, in line with standard economic doctrines, the potential for financial crises may increase.

5.2 Transition

5.2.1 Monetary reform

Under the system of economic planning that was in place in China from the beginning of Communist rule in 1948, until 1978 when central controls began to be dismantled, there existed two distinct monetary circuits: a credit circuit and a cash circuit. All investment and purchases of inventory by firms were undertaken through the transfer of credit money. Fixed capital investment was financed by transfers directly from the state budget in the form of non-repayable grants, allocated in accordance with the physical plan for production and investment laid down by the State Council. Working capital requirements were paid for by transfer between the accounts of corporations: upon receipt of a delivery of capital goods, the balance of the account of the firm receiving the goods would be debited for an amount calculated using the administratively-set price for the goods, and a corresponding credit would be applied to the account of the producing firm. There was therefore no circulation of currency in the productive sector of the economy. All payments took the form of accounting operations: adjustments to the balance sheets of transacting parties. The remainder of the economy operated on the basis of transactions conducted using cash payments. These transactions consisted of payments of wages, household purchases of consumption goods, payment of taxes and personal savings.

These two forms of money were not freely convertible, although mechanisms existed through which conversion would occur.[1] Administrative control of the two circuits was assumed through the application of three plans: the Cash Plan, the Credit Plan and the State Budget. These were formulated in the following

[1]For example, firms often exceeded their quotas for the employment of workers, requiring an additional cash allocation, which in turn would require increased allowances from the state budget to accommodate the additional expenditure.

manner: first, physical quantities for fixed capital investment and the production of consumption goods would be decided by the State Council. Budget allocations for firms would then be decided through an iterative process whereby details of the target quantities for production and investment would be provided to local branches of the central bank. These branches would then submit proposed budgets to the central authorities who would compile final targets for the quantities of credit and cash required to fulfil the physical plan (Girardin, 1997).

This system was similar in form to the approach taken by the Soviet Union and other socialist countries such as Poland, with the key feature being the separation of money for consumption and money for investment. Under a system of this type, the characteristics and functions of money and credit are quite different to those of a market economy with a developed banking system. The productive sector effectively operates as a "pure credit" economy with all transactions taking place as balance sheet transfers. Fiat money performs no role as a store of value or means of transaction but operates solely as the *numeraire*. Under such conditions, with money operating as a pure unit of account, "notions such as market-determined interest rates, liquidity preference, cost of funds, collateral, and credit-worthiness" cease to hold any relevance (Dow et al., 2008).

The limited convertibility between the two forms of money reduces the active status of cash. In a bank-based capitalist economy, cash forms one component of high-powered money: those liabilities of the state to which all other forms of money and credit are eventual claims. With the connection to productive investment severed, and with prices and wages fixed by the government, cash plays a passive role in facilitating the purchase of consumption goods, as well as providing households with a means of saving.

The Cash Plan of the Chinese system was formulated with the intention of controlling inflation through the maintenance of a fixed relationship between the quantity of currency in circulation and some measure of sales of goods to households. The approach taken was therefore implicitly based on the quantity theory of money in the formulation presented by Fisher (Guo, 2002; Tam, 1995b). This approach was, to a large extent, retained after 1978 when the mono-bank system began to be dismantled and China started the process of transition to commercial banking and the use of indirect instruments of monetary policy.

During the process of transition, the barrier between the two monetary circuits was removed. The requirement for corporations to perform all transactions using credit money was dropped, allowing for the use of cash within the pro-

ductive sector of the economy. The initial result of this was the expansion of the cash circuit of the economy into the enterprise sector, resulting in an increasingly "monetised" economic system. With the expansion of the use of circulating currency, cash ceases to act as a passive "ration card" for the household sector, and instead begins to function as a component of the monetary base. This was formally acknowledged in 1986 when the State Council officially adopted monetary aggregates as the intermediate targets of monetary policy with the dual objectives of maintaining stability of the currency and the promotion of economic development as final targets.

The transition to a market based system was marked by serious problems in controlling credit expansion. Credit and monetary growth invariably exceeded the quantitative targets set for them in the Credit Plan, giving rise to two periods, in the late 1980s and mid 1990s, of strongly expansionary credit growth accompanied by high inflation—see Figure 5.1. These were followed by painful deflations as the government adopted austerity measures in an attempt to rein in inflation. These measures were implemented through a combination of tight monetary conditions, and through direct administrative measures. It is likely that without recourse to what is referred to in economic textbooks as 'moral suasion', the authorities would have been unable to bring credit expansion back under control during these episodes.

5.2.2 Banking sector structural and regulatory reforms

The 'Stages of Banking' analysis, developed by Chick (1986), places an emphasis on the specific institutional and historical circumstances under which banking and financial development occurs. The approach outlines a number of sequential stages in the development of the banking system. The transition from the use of cash to the use of bank liabilities as a method of payment is central to the model. Chick describes how the gradual increase in acceptance of bank liabilities as a transactions mechanism occurs as an outcome of increasing public confidence in the banking system.

This confidence is strengthened further with the development of mechanisms for inter-bank lending of short-term liquidity. Chick describes a process of transition from an initially segmented system in which no mechanism exists for the reallocation of liquidity between surplus and deficit units, resulting in only limited acceptability of the deposits of each bank as a means of payment. With the

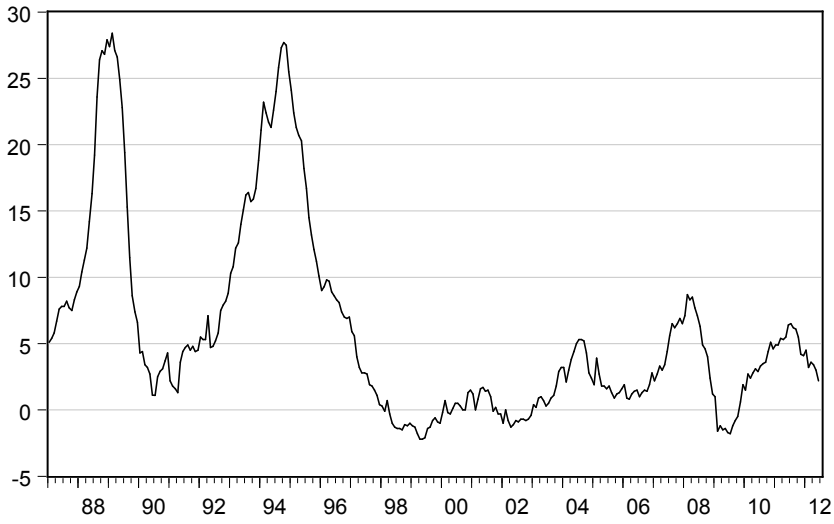


Figure 5.1 – Consumer price inflation, percent per annum

Source: IMF, Datastream

introduction of inter-bank lending, confidence grows, and deposits become more widely acceptable as a transactions mechanism. With the eventual development of a system in which liquidity is provided on a systemic basis by the central bank, commercial banks take on not only the role of depository institutions and facilitators of payments, but also the ability to issue new money through the creation of deposits backed by newly issued loans.

Once confidence in the banking system has been instilled in the population, and the banking habit is established, deposits begin to perform the role previously held exclusively by cash: that of a means of making payment. It is at this point that the mechanism emphasised here becomes possible: the potential exists for planned saving and investment to diverge, due an elastic supply of bank credit. The potential for money creation to allow for investment to precede savings is strengthened with the subsequent stages of banking system development: the emergence of inter-bank lending mechanisms, and the adoption of full responsibility of the role of lender-of-last-resort by the central bank.

Dow et al. (2008), present an analysis of the transition from the mono-bank system in the countries of the former Soviet Union, using Chick's 'Stages of Bank-

ing' as a frame of reference. They show that the breakup of the mono-bank system in these countries was initially accompanied by a sharp increase in the use of cash as shown by an increase in the cash to deposits ratio and a corresponding decrease in the deposits as a share of GDP. It is argued that the breakdown of confidence in the banking system that accompanied the transition was in large part a result of the speed of reforms.[2] Dow et al. argue that the policies implemented during the reforms period in the countries of the former Soviet were formulated without consideration of the fact that the confidence in the banking systems that allows for the eventual use of deposits as a means of payment has historically taken root as part of gradual process over a period of time.

While the transition to a market-based system was of a piecemeal nature in China, measures of cash usage increased significantly in the years following the introduction of market reforms to the banking system. These increases were of a lesser magnitude than those seen in the countries of the former Soviet Union, suggesting that confidence in the banking system did not suffer to the same degree. The increasing degree of monetisation of the economy was reflected in high rates of growth of both base money and broader monetary aggregates. This increase in the money supply in the period after the initial reforms was not at first accompanied by high rates of inflation. Over this period, rates of monetary growth were in fact higher than the sum of inflation and GDP growth (Girardin, 1997). Even with the onset of austerity measures in the late 1980s to combat rising inflation, the rate of increase of M2 remained above 25%, even as inflation was brought back down under 5%.

Under central planning, all banks effectively operate as branches of the central bank, serving primarily as cashiers for the mono-bank system. Starting in 1978, a series of reforms were enacted with the intention of devolving responsibility for lending and deposit-taking from the central bank to newly created state-owned commercial banks. These reforms took place alongside the introduction of a 'dual-track' pricing system, which allowed firms to begin selling, on the free market, anything produced after fulfilling their planned quota.[3] The intention of these reforms was to create a two-tier banking system. This would consist of commercial banks, capable of making autonomous lending decisions based on

[2]Sachs & Woo (1997) argue that the gradualist approach taken in China would not have been possible in the former Soviet Union countries, due to differences in economic structure at the time of transition

[3]This dual track system continued until around 1990, when the government began to allow prices to be fully market determined. (Mu, 2007)

evaluations of the credit-worthiness of borrowers and the viability of investment projects, leaving the central bank the role of supervision and liquidity provision.

Over the period 1979–1984, four specialised state-owned commercial banks (SOCBs) were separated from the PBC and other state ministries and each given responsibility for the provision of credit to enterprises in a specific sector of the economy.[4] The creation of these "Big Four" banks was intended to transfer commercial activities away from the PBC, leaving the central bank the role of credit provision to cover the shortfall between deposits and loans, and to cover short-term and seasonal needs. Initially, however, the four new state-owned commercial banks continued to operate essentially as arms of the People's Bank. All deposits were initially required to be surrendered to the PBC, while credit would be allocated to the banking system according to the Credit Plan. Between 1979 and 1984, gradual reforms were introduced, allowing the SOCBs to lend based on the level of deposits held, and to allow the lending of excess reserves directly between banks. (Wu, 1995, pp. 86–87) From 1985, the restrictions on the sectors in which these banks were allowed to operate were relaxed. (Berger et al., 2009)

From 1985, another layer of financial institutions emerged, in the form of joint-stock banks and regional banks, resulting in a three-tier banking system. The gradual liberalisation of the banking system continued, alongside the introduction of more indirect regulatory controls, such as reserve requirements.

In practice these institutions found it impossible to restrain the growth of credit, and in particular to control the credit extended to the large state-owned enterprises that were the backbone of the Chinese economy. This was in part a result of policy lending by state banks in excess of the Credit Plan. What tended to happen in such situations was that any banks which found themselves with a shortfall of funds would receive loans from the PBC in order to make up the difference. According to Girardin, the PBC officially recognised the discrepancy between the credit plan and actual lending:

> The PBC even made known the imbalance in the credit plan. In official Chinese terms, the plan had a *gap*. This term refers to the amount of bank loans, usually for working-capital investment, recognised as necessary but not included in planned credit growth. The gap was quite large, usually over 10 per cent of the credit plan and 22 per cent

[4]The Agricultural Bank of China, the Bank of China and People's Construction Bank of China were established in 1979 and the Industrial and Commercial Bank of China in 1984

of the credit plan on average between 1986 and 1990. (1997, p. 70)

During this transition period the PBC continued to rely heavily on administrative measures to control credit. This was possible due to the close relationships between the PBC and the state commercial banks that existed as a legacy of the mono-bank system. Nonetheless, with liberalisation, the use of indirect instruments took on an increasing role. The PBC experimented with a number of different instruments over this period: Xie (2004, p. 19) lists fourteen different monetary policy instruments introduced since 1983. Some have since been abandoned, either temporarily or permanently, while the use of others has been been retained.

The re-discounting of commercial bills was introduced by the PBC in 1986, in response to problems caused by the mechanism by which banks were used to collect trade debts. The clearing system in operation at the time was configured in such a way that banks were responsible for the collection of outstanding debts once delivery for goods had been made. The result of this was that banks would often end up bailing out the creditor in situations where the company receiving goods was unable to pay. (Holz, 1992, pp 82–83)[5] The introduction of re-discounting by the PBC, and the legitimisation of the discounting of commercial bills by banks was introduced as a way of allowing the banking system to accommodate overdue trade credit, and prevent the "chain reaction" breakdowns in production that can occur with enterprise defaults.

The tentative first steps towards a unified system of decentralised inter-bank liquidity management took place while the Credit Plan was still operational. An informal system of inter-bank lending had been in operation since the 1980s but the system was thrown into disorder and progress on reforms halted by the inflationary episodes experienced in the late 1980s and early 1990s when inter-bank lending was increasingly used for illegitimate purposes. Girardin (1997) argues that the system of inter-bank lending acted as a mechanism for side-stepping regional credit ceilings. Although the inter-bank system was intended as a way for banks to cover short-term liquidity needs, banks with excess reserves used inter-bank lending to fund investment in other regions, thus breaching the limits set in the Credit Plan. Although, in principle, the maximum allowable maturity of loans

[5]Similar problems occurred under the period of central planning in Poland under a system of automatic crediting whereby firms would send their invoices directly to banks rather than counterpart firms. These invoices would be paid automatically, regardless of whether the purchasing firm had available credit. (Podolsky, 1973)

was 7 days, in 1988 around 70% of loans between banks were of maturities of over one month, suggesting that these loans were being used for purposes other than short-term liquidity management. These problems continued into the early 1990s during which time the inter-bank market was also used as a source of long-term funds for speculative investment in real-estate (Guo, 2002; Duo, 2002).[6] In addition to the restoration of inter-bank markets, this period also saw the gradual introduction and spread of non-bank financial intermediation, in particular the establishment of the Shanghai and Shenzen stock markets in 1990.

The excessive credit growth during this period is often characterised as resulting from soft budget constraint behaviour on the part of state banks. "Soft budget constraint" refers to the prediction that institutions, and in particular banks, which are not under private ownership will have an inherent expansionary tendency, regardless of their capacity to finance such expansions. This arises because these institutions operate under the assumption that any financial shortfall they may encounter will be made good using public resources (Kornai, 1979). In this view, the sequence of "stop-go" cycles which occurred during the late 1980s and 1990s are result of the interaction between the expansionary and inflationary tendencies arising from excessive bank lending, and opposing contractionary responses from the state in the form of centrally imposed austerity. It is argued by Lo et al. (2011) that this takes too narrow a view of the respective roles of banks and the state: such a view overlooks, for example, the role played by state banks in the late 1990s in acting strongly to constrain credit growth, and the effects of government policy in generating expansionary impulses, for example in the period following the 2008 global financial crisis.

Following the inflationary outburst of 1988, austerity measures were imposed, remaining in place until around 1990 when easing began once more. Inflation remained moderate until 1993 when credit extension once again ran out of control, leading to the introduction of further austerity measures from the summer of 1993 through 1995. These initially took the form of restrictive policies on banks, requiring lending to be withdrawn and interest rates to be raised. Subsequently the emphasis switched to more direct administrative measures, aimed at bringing down the rate of investment growth.

This period saw the formal adoption of market socialism by the State Council

[6] McKinnon & Schnabl (2009) argue that the failure to control credit during this period was a result of China's floating exchange rate. Once the currency was pegged to the dollar in 1997, the nominal anchor provided the credibility required to rein in inflation.

in 1993, and the introduction of a further series of reforms of the banking system. The most significant of these was the creation in 1994 of three state policy banks (Wei, 1999), which were to take over the non-commercial roles of the "Big Four" banks—issuing state-directed credit to SOEs—with the intention of further deepening the commercialisation of lending by the state-owned commercial banks.[7] In 1995, the role of the PBC as central bank was formally established by the Law of the People's Bank of China, as was the status of the commercial banks by the Law of the Commercial Banks, which directed these banks towards commercial lending instead of policy lending, and required these banks to take responsibility for their own profits and losses.

The expansionary periods of the late 1980s and early 1990s resulted in a build-up of bad debt on the books of the commercial banks. To deal with this problem, a programme of recapitalisation was initiated, with non-performing loans gradually transfered to the balance sheets of newly established asset-management corporations. This programme was highly successful, with NPLs falling from 30% in 2001 to 6% in 2007. The majority of the remaining NPLs were left on the books of the Agricultural Bank of China, which finally underwent a 130 billion yuan recapitalisation in 2008. Over this period, the PBC continued to move towards a more regulatory approach to control over the banks, with the NPL problems resulting in a focus on capital adequacy requirements.

In 1996, the inter-bank system was unified from a collection of segmented regional institutions into a national system based on electronic trading of reserves, (the CHIBOR market) and base money was explicitly specified as the operational target of monetary policy (Green, 2005). In 1998 the Credit Plan was switched from being, at least in theory, a binding constraint on firms, to being "indicative" in form. This took the form of targets announced by the PBC for both broad money and the credit growth.[8]

In 2001, China's formal entry into the WTO prompted a further sequence of liberalisation reforms, in particular with respect to the foreign ownership of Chinese banks. In 2003, the China Banking Regulatory Commission (CBRC) was established, with the role of performing oversight of reforms and regulations. Soon after its inception, the CBRC updated the rules on foreign ownership, such that

[7] These newly created policy banks were the National Development Bank, the Export-Import Bank and the Agricultural Development Bank.

[8] These targets were announced up until 2008 but as a result of the stimulus introduced following the collapse of Lehman Brothers, the 2008 targets were cancelled. No targets were announced in 2009, but a broad money target was reintroduced in 2010 (Cassola & Porter, 2011).

individual foreign investors could take stakes of up to 20% in Chinese banks, with a maximum of 25% total foreign ownership. In 2004, the "Big Four" commercial banks were converted to joint stock companies, with shares listed on both domestic and foreign stock markets. Foreign banks have subsequently taken significant states in the "Big Four" commercial banks.

Subsequent to China's WTO entry, during the period from 2002 until the end of 2006, a transitional regime was put in place during which the restrictions on foreign control of banking institutions was gradually relaxed, leading to an influx of foreign bank entry.[9] Over this period, restrictions were relaxed first on the provision of foreign currency services by foreign banks in 2002, and subsequently on local currency services in 2004. (Berger et al., 2009). In January 2007 onwards the transition to fully open status under WTO rules was completed, with foreign banks free to conduct business in China from 2007 onwards (Meng, 2009). However, despite these reforms in the form of liberalisation and privatisation, state-owned or state-controlled banks still account for the majority of China's banking system.

The CBRC maintains a comprehensive regime of bank regulations, which incorporate requirements on capital adequacy, liquidity provision, and credit risk. These regulations stipulate loan-to-deposit ratios of 75 percent, and an even lower ratio for the large state banks. In practice, as well as serving to control liquidity risk, this requirement acts as a restraint on the ability of banks to lend.[10] In January 2013, the CBRC issued new rules on capital adequacy ratios, in line with the Basel III regulatory requirements. These new regulations specify minimum capital adequacy requirements of 11.5 per cent for systematically important banks, and 10.5 per cent for other commercial banks (KPMG, 2012). These rules specify that banks must comply with the new requirements by the end of 2018.

Since 2005, banks in China have been required to set aside loss provision reserves of at least 1% of loans outstanding. It was reported in 2010 that this ratio will rise to 2.5% (China Daily, 2010). The CBRC also requires banks to hold loan-loss reserves equal to 150% of current bad loans, although it has been reported that this figure will be reduced to 100%, to assist banks in reaching the new capi-

[9] An earlier period of foreign bank entry took place over the period 1994–1997, following the opening of eleven inland cities to foreign financial institutions. (Meng, 2009). Prior to this reform, foreign banks were permitted to operate only in the four Special Economic Zones (SEZ's) in southern China. (Han, 2006)

[10] It was recently reported that this requirement is to be relaxed, in order to reduce this restriction on banks lending (Reuters, 2012a).

tal adequacy requirements (Marketwatch, 2012).

As noted by Ju & Lo (2012), a significant additional role of the authorities lies with their recognition of the importance of preventing the transmission of system risk by maintaining a separation between banking and capital markets. This is achieved by enforcing "lend as you pay" agreements which stipulate that funds are not disbursed directly to the firms which have undertaken the borrowing, but instead are directed to the trading partners of these firms. In this way, firms are prevented from using borrowed funds for speculative activity in the financial markets. Further, commercial and investment banking activities are separated, with commercial banks prohibited from engaging in capital market activities and investing directly in non-bank enterprises.

A major challenge is posed to the regulatory capabilities of the authorities by the increasing scale and significance of informal financial intermediation. The Chinese shadow financial system consists of a wide range of institutional forms—from kerb-side lending and pawn shops to large banks and trust companies—operating outside of the usual regulatory requirements. The increasing significance of informal finance was thrown into the spotlight when the shadow banking system in the coastal city of Wenzhou collapsed after real estate prices fell following official monetary tightening. The nature of these institutions makes measurement of the scale of shadow financial structures difficult, but one recent estimate has put shadow banking assets at around 11.5 trillion yuan (Deloitte, 2012, p. 21). Of particular significance is the increasing role of informal securitisation activity, in which loans are re-packaged and sold to investors as "trust products". The rapid growth of such practices led the PBC to introduce new statistical measures on "total social financing" in an attempt to track the scale of off-balance sheet lending.

There appears to be a close association between Chinese trust products and housing and real estate activity: it was reported that real-estate trusts were the fastest growing sector of the trust industry in China in 2010-2011 (Reuters, 2012b). Since firms may operate using both informal and formal finance, and formal financial institutions may provide a source of funding for informal lending, there exists obvious potential for contagion effects between the two. Monetary tightening may result in funding problems in the informal sector, while problems in the informal sector which lead to credit shortages for firms, could have spillover effects on the formal sector. This lack of a clear line of demarcation between formal and informal financial structures results in mechanisms by which the strict official

Monetary policy operations	
Liquidity-injecting standing facilities	Liquidity-absorbing standing facilities
Liquidity-injecting outright OMO	Liquidity-absorbing outright OMO
Liquidity-injecting repo OMO	Liquidity-absorbing repo OMO
	Required reserves
Autonomous Factors	
FX reserves	
	Government deposits
	Excess reserves
	Banknotes in circulation

Table 5.1 – Example central bank balance sheet

Source: (Toporowski, 2007; Bindseil, 2004)

separation of commercial and investment banking activity may be overcome. As a result, it appears that speculative activity in real-estate and stock markets, and associated macroeconomic instability, are increasingly fuelled by informal credit.

5.3 Monetary policy implementation details

Having outlined the steps taken during the transition period, the analysis now turns to the details of the current operating procedures used by the PBC. Following Toporowski (2007) and Bindseil (2004), a useful framework for the analysis of monetary policy implementation can be obtained by the division of the central bank balance sheet into two sections: *monetary policy operations* and *autonomous factors*. Table 5.1 summarises the main items in these two categories.

5.3.1 Monetary policy operations

The first category, *Monetary policy operations*, includes the following: Both outright and "repo" open market operations, standing facilities, and reserve requirements. As Toporowski (2007) observes, this section of the balance sheet "summarises those monetary operations that are currently thought to be of significance among the major central banks whose practices inform contemporary monetary theory" (p. 9). Under the New Consensus view on monetary policy implementation, a convergence of opinion between academics and central bankers has taken place. With the resurrection of the Wicksellian approach in which inflation is

determined by the deviation of the money rate of interest from the equilibrium natural rate, the gap between academic theory and the views of central bankers has narrowed. Central bankers, or at least those from Western nations that tend to influence debate most strongly, have long argued that the steering of short-term interest rates, rather than control of monetary aggregates, is the primary task of the central bank.[11]

The new consensus doctrine holds that the optimal approach to the implementation of monetary policy is through the use of a "channel" system of standing facilities (Bindseil, 2004; Woodford, 2003). Under a system of this type, the central bank provides both deposit and loan facilities to eligible financial institutions at fixed rates of interest. Unlike the current discount window at the Fed, the use of such facilities should not carry any negative connotations about an institution's balance sheet, and access should be freely available when backed by valid collateral such as government securities. By making daily adjustments to the net liquidity of the banking system through open market operations, the central bank can accommodate short-term fluctuations in money demand, while maintaining the level of clearing balances at close to a net position of zero. The market for overnight money should then clear at a position close to the half-way point between the deposit and loan rates, allowing for very close control over short-term rates.

This shift in the academic view implies a diminished role for open market operations compared to their central position in the preceding monetarist doctrine. In that view, open market operations were seen as the primary method for regulation of the level of credit in the economy. Direct operations on the monetary base would, via stable multiplier relationships, result in proportionate changes in broader aggregates.

Since magnitudes of monetary aggregates are largely determined by the demand for new bank lending, this shift in academic emphasis away from such aggregates is a welcome development, regardless of the deficiencies of much of the theory that underlies it. However, in the case of developing and newly-industrialising countries, or those countries that operate currency board arrangements, intervention in the currency markets is often inevitable if the central bank

[11] Goodhart argues that the apparent effectiveness of monetary targets in bringing down inflation in the UK in the early 1980s was in fact due to the resulting increases in the rate of interest: "The policies adopted in the early 1980s did, however, allow the authorities freedom to raise interest rates to levels that did subdue inflation, and the accompanying check to output growth, though severe, was indeed temporary" (1989, p. 296)

Assets		Liabilities	
		Monetary policy operations	
Claims on financial corporations	18,962	Deposits of financial corps. (required)	83,594
		Bond issues	42,064
		Autonomous Factors	
Foreign Assets	185,331		
Claims on government	15,662	Deposits of government	21,226
		Deposits of financial corps. (excess)	18,835
		Currency issue	41,555
Other assets	7,845	Other liabilities	20,256
Total	227,530	**Total**	227,530

Table 5.2 – Balance sheet of PBC, December 2009, rearranged, 100,000 yuan

Source: PBC, own calculation

is to avoid fluctuations in exchange rates feeding through into changes in the domestic price level (Toporowski, 2007).

Given China's policy of maintaining a fixed, or closely controlled crawling rate of exchange against the dollar, balance-sheet operations are a central element in the PBC's implementation of monetary policy. The foreign exchange inflows resulting from China's current account surplus, along with significant levels of FDI, have resulted in very high levels of intervention in the foreign exchange markets by the PBC, which in turn have required large-scale sterilisation operations on the liability side of the balance sheet.

The composition of the balance sheet of the PBC as of December 2009 is shown in Table 5.2. This balance sheet has been simplified and rearranged in order to match as the categorisations in Table 5.1 as closely as possible.

Standing facilities

The PBC provides both liquidity-absorbing and liquidity-injecting standing facilities. A re-discounting facility has been maintained since its introduction for

the purposes of financing trade credit, as described in the previous section. The rate at which the PBC discounts bills was reformed in 1998, in order to link this discount rate to the official PBC policy rate of interest. Previous to this reform, the rate at which the PBC would re-discount bills was set with reference to the prevailing rates in the inter-bank market, rather than with a view to influencing those rates, essentially severing any connection between the PBC policy rate and money market rates.

On the liquidity-absorbing side of the balance sheet, the PBC provides a remunerated deposit facility for the excess reserves of commercial banks. This facility was combined with the required reserves account in 1998, such that both required and excess reserves were remunerated at the same rate. This remained the case until 2003 when, in response to concern about the high level of excess reserves held by the banking system, the PBC reintroduced the distinction between required and excess reserves and reduced the rate of remuneration on excess reserves to 1.62% while leaving the rate paid on required reserves unchanged at 1.89%. The rate on excess reserves was subsequently cut again in 2005 to 0.99% (Goodfriend & Prasad, 2006).

Although the provision of these two facilities does theoretically impose upper and lower bounds on the levels at which the money market can clear, in practice these rates have exerted little influence on the market. The spread between the two rates is significantly larger than the 50 basis points advocated by proponents of the new consensus system—for example, in 2005 it was over 200 basis points. A notable feature of the relationship between the banking system and the PBC is the lack of activity at the re-discount facility over the last decade: the high level of liquidity of the banking system has meant that recourse to central bank credit has been minimal, with only occasional borrowing to cover sudden increases in demand for cash at busy times of the year. Thus, instead of adjusting the liquidity of banking system such that net clearing balances are close to zero on a nightly basis, the banking system has remained structurally in credit with the PBC, with high levels of excess reserves left on deposit at the PBC, as indicated by the large excess of deposits of financial corporations over claims on financial corporations.

Godley & Lavoie (2007) draw a distinction between *asset-based* and *overdraft* financial systems. They argue that most textbooks describe asset-based systems, characterised by large holdings of government securities by the banking sector, whereas most economies operate as overdraft-based systems such that the banking systems remain in structural deficit towards the central bank. With the advent

of liability management techniques in the last couple of decades, Anglo-Saxon economies have moved closer to the overdraft-based model. (p. 374). With respect to China, Lavoie & Wang claim that "central bank advances to commercial banks and other financial institutions constitute an entry with substantial amounts. By contrast, claims on domestic government are relatively small, at least until recently, thus meaning that China can be said to be an overdraft economy." (2012, pp. 292–293)

However, this view overlooks the significance of the very large volumes of bank reserves held with the PBC. Although the majority of these reserves are "illiquid" due to being held as required reserves (see next section), they still represent liabilities of the central bank. China does not therefore conform to either classification, and instead should be classified separately as a *foreign exchange-based* financial system in that the central bank is in structural deficit *towards the banking system* while offsetting this deficit through foreign-exchange holdings.

Reserve requirements

As can be seen from Table 5.2, the majority of the deposits held by the the banking system with the PBC are made up of required reserves. In 2009, the main required reserve ratio stood at 15.5%, while by late 2011 it had reached as high as 21.5%. The use of reserve requirements in this manner, as a policy tool for freezing banking-sector liquidity on a large-scale basis, is unorthodox when viewed in the context of the current consensus.

The justification given by Western economists and central bankers for imposing reserve requirements on the banking sector has changed over time. The view that required reserves provide a liquidity cushion to protect the banking system against over-lending or unforeseen systemic risk has largely been discarded. Reserve requirements have been dropped completely in some economies, for example the United Kingdom. The use of required reserves as a monetary policy tool for directly controlling monetary variables through changes in the aggregate liquidity of the banking sector has also fallen out of favour since around the 1970s, with current opinion based around the view that reserve requirements are primarily a mechanism for the stabilisation of short-term interest rates.

In an overdraft-based system, as described above, the structural liquidity deficit required to make standing facilities effective tends to result in the volatility of short-term interest rates due to unexpected demand for reserves for clearing

purposes or in response to other shocks. By imposing reserve requirements, the central bank can ensure that the banking system maintains a level of reserves sufficient to cover most of these unforeseen shocks, while still remaining dependent on the central bank for liquidity provision (Bindseil, 2004, pp. 195–196).

In contrast, the required reserve ratio set by the PBC is set greatly above the level required for liquidity management of the type described above, while the increasing frequency of changes to the ratio demonstrate that this is a key tool of monetary policy for the PBC.[12]

The use of this instrument on such a scale is the result of the sterilisation needs imposed by intervention in the foreign exchange markets. The foreign reserve accumulation resulting from operations to maintain the level of the exchange rate have resulted in a large structural liquidity surplus, and reserve requirements have become the policy tool of choice for absorbing this liquidity.

According to Ma et al. (2011, p. 14), this instrument has come to dominate over other sterilisation tools, such as bond issuance, for a number of reasons. Firstly, it is more permanent than bond issuance, since bonds are issued at relatively short maturities and thus can be left to mature by banks that are in need of additional liquidity. Further, these short-dated securities may be less effective as a means of liquidity control once large and active markets for the bonds come into operation. Secondly, the cost to the PBC is lower—the remuneration on required reserves has generally been below the rate paid on bonds. Finally, changes to the required reserve ratio may be enacted without directly broadcasting any signals about policy rates of interest. This leaves greater scope for open-market operations to be used for manipulation of interest rates, rather than acting purely as liquidity-draining operations at the current market rate.

The complexity of the system of required reserves has increased over time, with differential rates applied to large and small banks, and much lower rates imposed on foreign currency deposits. The ratio of required to excess reserves shown in Table 5.2 is calculated using the average of the "small bank" and "large bank" reserve ratios, which were 13.5% and 15.5% respectively. The figure shown in Table 5.2 therefore probably underestimates the level of required reserves.

[12]Between 1984 and June 2003 the required reserve ratio was adjusted six times. Between July 2006 and June 2011 it was altered 35 times (Ma et al., 2011).

Open market operations

The remaining item under *monetary policy operations* is open market operations. These constitute operations carried out at the discretion of the central bank with the intention of altering the aggregate level of reserves held by the banking system. As already noted, the relative significance of these these operations as monetary policy tools has been downgraded in advanced economies in accordance with the new consensus doctrine. Such a view is less appropriate in the case of a country such as China, given the level of development of the banking system, as described in Section 5.2.2, and the structural liquidity surpluses arising from the intervention in foreign exchange markets.

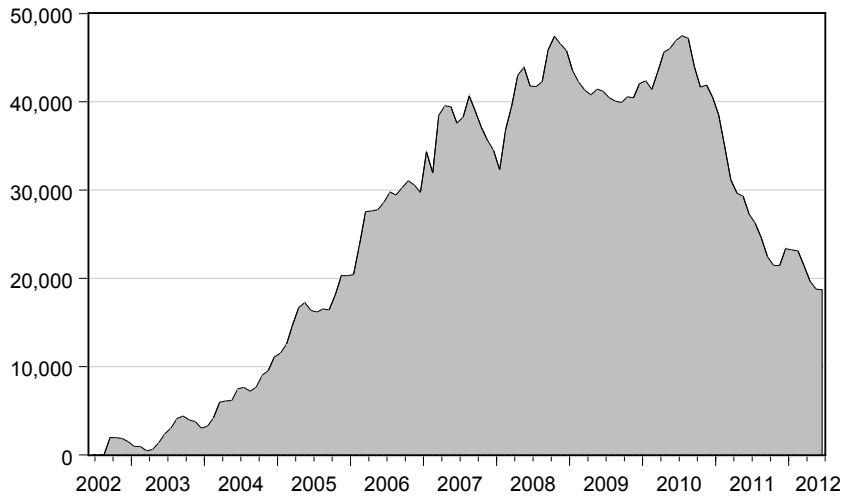


Figure 5.2 – Outstanding volume of bill issued by PBC, 100,000 yuan

Source: PBC

Open-market operations were reintroduced by the PBC in 1998, initially as a means of injecting liquidity to cover temporary shortfalls.[13] This was done using outright operations, such that the PBC would purchase treasury bonds to hold until maturity. With the onset of the structural balance of payments surplus, the PBC switched to the use of reverse repo operations in response to the increasingly high levels of liquidity in the banking system. By 2002, the outflows of

[13]They were initially introduced in 1993 but rarely used as a result of the under-development of inter-bank market. This led to the suspension of their use in 1997 (Geiger, 2008, p. 9)

government securities from the PBC were unsustainable: a shortfall in eligible government paper for OMOs led the PBC to begin issuing its own bills for the purposes of sterilising foreign exchange inflows.

The volume of PBC bills total outstanding over time is shown in Figure 5.2. As can be seen from the figure, the increasing issuance of bills for sterilisation purposes continued until late 2008 when, in response to the Lehman's crisis the PBC reduced its sterilisation operations in order to increase the liquidity available to the banking system. Issuance began again in 2009, but from late 2010 the PBC began to significantly scale back bill issuance. By this point the use of central bank bills was superseded by the required reserve ratio as the favoured sterilisation tool, as described in the previous section.

In addition to sterilisation operations using its own bills, the PBC also conducts repo operations with the banking system at maturities between seven days and six months, again primarily for the purposes of draining liquidity.

5.3.2 Autonomous factors

The remaining items on the central bank balance sheet come under the heading of *autonomous factors*. This section covers those items that the central bank has no immediate control over on a day-to-day basis. This category is composed of such items as banknotes in circulation, government deposits and foreign currency.

In advanced market economies, the most important of these items is usually banknotes in circulation. Since these nations operate floating exchange rates, and it is the institutional arrangements of such nations that tend to influence academic discussion on the implementation of monetary policy, the effect of foreign exchange reserves on the balance sheet of the central bank tends to receive little discussion.

During the period of transition described in Section 5.2, China operated a dual-rate system of foreign exchange. These rates were unified in 1994, and in 1996 renminbi convertibility on current account was introduced. Since this point, the Chinese authorities have kept the value of the yuan under tight control. A fixed peg to the U.S. dollar was maintained from 1998 until 2005, when the State Council announced a switch to a "basket, band and crawl" regime. Since then, the yuan appreciated by around 20% against the dollar until the Lehman's crisis in 2008, at which point appreciation halted until late 2010. From late 2010 appreciation resumed.

This tight control on the value of the currency was maintained in the face of a continuously increasing surplus on the current account, up until the crisis of 2008. The PBC has thus been required to intervene heavily in foreign exchange markets to prevent appreciation of the yuan. The result of this is that foreign currency reserves are the most significant item on the balance sheet, both in terms of size and in terms of the influence exerted on monetary policy. By 2011, foreign exchange reserves held on the balance sheet of the PBC had reached over RMB23 tn., the equivalent of over US$3.5 tn. at current exchange rates.

The sterilisation operations required to counteract the expansion in bank reserves resulting from this intervention in the currency markets have mostly been outlined in the previous sections. However, one item under *autonomous factors* is also regarded by some as a form of sterilisation tool. This is the change in deposits held at the central bank by the government. Under monetarist doctrines, it was held that "the net fiscal deficit was an addition to the deposits of the banking system" (Toporowski, 2007, p. 19). Similarly, if the volume of government deposits rises due to payments to the government, rather than deficit financing, this reduces the net deposits of the private sector, and may be regarded as liquidity-reducing. Thus, in periods in which the level of government deposits have risen autonomously, this has partially displaced the need for sterilisation through other instruments such as bonds or required reserves.

5.3.3 Interest rates

Market rates

The new consensus regards the steering of short-term rates of interest as the most effective procedure for central bank regulation of credit and inflation. Given the assumption of perfect financial markets in many modern monetary models, any adjustments to the risk-free rate of return at the short end of the yield curve are immediately transmitted to all other maturities through arbitrage relations. Thus, by maintaining control of short-term rates of interest, the structure of longer-term rates can be shifted in response to changes in inflation. This understanding of the way that the monetary transmission mechanism operates on financial markets lies behind much current empirical research on credit markets in China. Such studies attempt to isolate the degree to which longer term interest rates are "arbitrage free" and "efficiently determined" (eg. Cassola & Porter, 2011; Feyzioglu et al., 2009).

While assumptions such as arbitrage-free yield curves are problematic in financially advanced economies, they are even more so in the case of China, since the determination of interest rates at various maturities occurs through a combination of market structures and PBC regulations.

At the longest maturities, the bond market is dominated by government debt. While yields are determined by the market, they are kept low by the fact that corporate debt issuance has been strongly discouraged by the authorities,[14] meaning that the depth of the market for longer-term debt is thin, with most enterprises financed through bank credit or retained earnings. The use of sterilisation bills by the PBC has added to the downward pressure on interest rates—it is in the interests of the PBC to keep rates as low as possible on these bills, both to minimise direct sterilisation costs and to avoid pressure on the exchange rate to appreciate.

At the short end of the curve, rates are set by inter-bank trading which now includes both a repo market and a unsecured call-loan market.[15] These interbank markets are highly active but trading is almost entirely confined to maturities of seven days or less. The rate of remuneration on excess reserves largely sets a floor under these money market rates but the PBC appears sanguine about money market rates drifting above the re-discounting rate, as has happened on a number of occasions. The PBC thus appears to exert very little influence over these rates, other than to set a floor. Further, given the levels of excess liquidity in the banking system, the degree to which these interest rates feed into bank lending decisions and pricing is questionable.

The PBC has been similarly inactive with respect to OMO at the short end of the curve. Although it has periodically intervened in the market to drain liquidity using repo operations, it has concentrated for the most part on sterilisation operations through bill issuance at 3-month and 1-year maturities. The lack of PBC influence on money market rates is apparent in the regular divergence of short term money market rates from the benchmark rates quoted by the PBC.

[14]The State Council's antipathy towards corporate bond finance is seen by Huang & Zhu (2007) as partly informed by the historical experience of foreign borrowing during the Qing dynasty when excessive sovereign debt issuance eventually bankrupted the government.

[15]Upper limits on inter-bank lending rates were abolished in 1996, and repos were introduced a year later in 1997. (Porter & Xu, 2009) In addition to the uncollateralised call-loan (CHIBOR) market and the repo market, the SHIBOR benchmark yield curve was introduced in 2007 and is set in a similar fashion to the LIBOR, based on quotes submitted by a designated panel of clearing banks.

Bank rates

Until 2004, all interest rates on the loans and deposits of the banking system were fixed by the State Council, leaving individual banks no leeway in pricing credit or competing for deposits. In 2004 regulations were adjusted so that these centrally imposed rates operated only as a floor to lending rates and a ceiling on deposit rates. These regulations therefore set a minimum interest spread for the banking system. As a results, deposit rates have remained fixed at the ceiling level, as banks compete to attract deposits.

During the period of central planning, prices of goods were fixed by the State Council in such a way as to impose implicit subsidies and taxes on different sectors of the economy, in accordance with the development planning approach. By setting the prices of final goods at above market levels, and capital goods at below market levels, the authorities provided a stimulus to high levels of investment. Likewise, the imposition of a fixed structure of interest rates on the banking system gives the authorities a powerful tool to affect the profitability of both the banking system and the firms that rely on loans for investment—the high spreads between lending and borrowing rates were imposed in part to protect the banking system in the wake of the recapitalisation and removal of NPLs. This imposition of interest rates, and in particular the capping of interest rates paid on deposits is regarded as distortionary and a form of financial repression which imposes significant costs on households in the absence of alternative financial assets in which to invest (Lardy, 2008; Park & Sehrt, 2001).[16]

5.4 Conclusion

This chapter has described the process of financial development in China over the period of transition from central planning and provided a detailed description of the current financial structure and the operating procedures of the People's Bank of China.

Although China's capital markets are extremely underdeveloped relative to other economies at a similar level of development, this does not imply that the

[16] Lardy (2008) argues that the financial repression caused by the imposition of low rates of interest results in transfers of value from households to other sectors in the economy. By comparing the real interest rate on deposits in 2008 with that which was paid in 2002—the point at which financial repression is seen to have started—he calculates that that the implicit tax on households accounted for over 4% of GDP in the first quarter of 2008.

level of financial depth in China is low. In fact, although China's financial system is dominated by the banking system, the overall level of financial intermediation in China is extremely high. In 2004, China's banking system held assets equivalent to 160 percent of GDP. This compares with figures of 77 percent in the United States, 119 percent in Singapore and 145 percent in Japan (Farrell et al., 2006). By the end of 2010, China's asset to GDP ratio was almost 190 per cent.

This level of bank depth is made possible, at least in part, by the ability of the authorities to prevent bank credit from flowing into other financial assets, either domestically or abroad. This has allowed for high rates of loan growth without the deposits created in the process fleeing the system. By forcing all of the new saving that arises out investment spending to remain within the banking system as deposits, the chances of banking crises are minimised, buying time for the authorities to continue with economic and financial restructuring. On the domestic side, this has been achieved by a strict separation of banking from the securities market, while capital controls have served to prevent outflows internationally. In this respect, the underdevelopment of capital markets and the lack of alternative investment opportunities may be both a cause and consequence of the stability of the banking system, despite high levels of credit growth. The increasing significance of informal finance appears, however, to be leading to a weakening of the barrier between bank lending and speculative activity.

The structural and institutional reforms outlined in this chapter have resulted in a relatively sophisticated banking system. The prerequisites are in place for the system as a whole to be able to generate new deposits, and thus savings, by issuing loans for investment—an active and liquid inter-bank market, a central bank providing liquidity to the system as a whole and standing ready to act as lender-of-last resort, and most crucially, sufficient public confidence in the banking system for the deposit base to remain stable.

The path taken during the transition period is key to this outcome. By adopting reforms gradually, and allowing the banking system to evolve out of the previous mono-bank system, the sharp loss of confidence experienced in other transition economies was avoided. The transition from a mono-bank system in which credit money performed to role of giro transfers to a modern banking system avoided a phase of segmentation and disintermediation, resulting in a step backwards to earlier banking stages in which deposits are required in advance of lending. Instead, over the period of reform, the Chinese authorities have been able to rely on directed credit to key industries to maintain aggregate demand

and growth, while largely avoiding inflation from the mid-1990s onwards.

Although the current operating procedures of the PBC are based largely on quantitative controls, the apparent similarity of the Chinese regime to episodes in advanced economies during which policy was guided by monetarist doctrine is misleading. The attempts of authorities in these economies to maintain control over broad aggregates by targeting the monetary base were predicated on the assumption of a stable multiplier relationship between monetary aggregates. These attempts were confounded when it became apparent that the volume of money in the system is "...institutionally determined and time-varying... the monetary base multiplier is only applicable for some of the earlier stages of banking history..." (Goodhart, 2002). In contrast, the Chinese monetary authorities have tended to announce broad credit targets. These are achieved as much through "moral suasion" with banks, and the influence of the authorities on the investment decisions of state-owned corporations, as they are by controlling narrow monetary aggregates.[17] Over most of the last twenty years, the Chinese banking system has held a significant volume of excess reserves with the central bank. Although some of these reserves are used for the purposes of settlement, the liquidity of the banking system implies that shortages of reserves have rarely served to restrain lending. Only in recent years have excess reserves come down to levels that would be likely to restrain credit growth. This has been accompanied by rising and increasingly volatile short-term interest rates, in common with the experience of Western economies during the period of attempted quantitative controls.

The doctrine of monetary control primarily through the use of operations which directly affect the volume of base money is founded on the assumption of stable relationship between output and the demand for various monetary aggregates, a set of beliefs originating with Friedman's (1956) restatement of the quantity theory of money. A large number of econometric studies have attempted to locate these stable money demand functions in the case of China, with little success.[18] Not only have estimated coefficients varied widely, but the signs of these coefficients are sometimes the opposite of expected values (Zuo & Park, 2011).

Thus, as centralised control on the demand and supply of credit at the aggregate level decreases as a result of endogenous financial development and the di-

[17]The PBC "maintains annual (and typically binding) bank-by-bank caps on credit growth"(Porter & Xu, 2009, p. 10)

[18]Eg. Merhotra (2008); Baharumshah et al. (2009); Bahmani-Oskooee & Wang (2007); Wu (2009); Xie (2004)

minishing market share of state-owned enterprises, the PBC will inevitably move towards a system of monetary regulation based on setting the price of reserves and allowing monetary aggregates to be determined endogenously:

> Central banks are... unable to reduce the rate of growth of the money supply, except by raising the supply price of reserves and so the level of short-term interest rates. Once it is recognized that loans are made at borrower initiative, and that loans create deposits, it logically follows that the money supply, bank reserves, and the high-powered base all vary endogenously (Moore, 1988, p. 26)

The PBC has already begun to move in this direction by allowing the interest rates charged on loans to be set independently by the banking system, thus conceding control of one key factor in determining the volume of loan demand. However, as long as the Chinese authorities continue to target the exchange rate, the resulting expansion of bank reserves will require the maintenance of sterilisation operations. As such, quantitative operations to influence the monetary base will remain a central aspect of PBC monetary policy intervention.

Chapter 6

China's flow-of-funds I: physical transactions

6.1 Introduction

Official flow-of-funds accounts accounts have been published by the Chinese statistical bureau since 1992. These accounts aim to provide an integrated quantitative representation of the macroeconomic system. This chapter undertakes a detailed study of these accounts, using them as a basis for a theoretically coherent case history of the last two decades of capital accumulation in China.

These accounts are used to show as defective those commonplace narratives which present the thrift of Chinese households as the virtuous trait which has driven the growth "miracle". It is demonstrated that the key to comprehending the Chinese growth story is the rising share of saving accruing as profits. The flow-of-funds system is used to show that "investment expenditure is ultimately constrained by access to finance, not by a deficiency of saving, because actual investment creates an equivalent amount of saving." (Harcourt, 1991, p. 1608). It is the expenditures of firms in the People's Republic that generate the savings of those firms and households alike. Contrary to the conventional wisdom, these firms as a whole do not face significant constraints in financing new outlays because of the availability of endogenously created bank credit, generating fresh liquidity to cover those expenditures which are lost due to the rising saving of households. Rather than being the virtue which has created the Chinese miracle, the increasing tendency to save, rather than spend, raises the prospect of a slump in the event that firms were to reign in investment spending.

The purpose of this chapter is to demonstrate that the patterns of investment and saving—and the associated financial balances—of the Chinese economy are the result of an endogenous credit-investment process. Using the flow-of-funds accounts, in conjunction with a number of other data sources, a sector-based macro-economic analysis is constructed in which the circular flow of income is the primary organising principle. In analysing all variables in the context of their place in a stock-flow consistent taxonomy, a system is derived in which the expenditures and incomes of all sectors must find their counterpart in opposite flows of other sectors.

This empirical framework is closely aligned with the theoretical system developed in Chapters 3 and 4. In particular a central role is given to the investment decisions of firms and the income flows generated as a result of these expenditures, in line with Kalecki's reflux theory of profit.

It is shown that these investment expenditures of firms are the prime determinant of the overall level of saving in the Chinese economy, reinforced in recent years by current account surpluses. The analytical framework allows for the isolation of the net financial balances of each sector, thus providing a coherent starting point for the monetary and financial analysis of Chapter 7. It is shown that the financial position of firms has improved over the last two decades such that investment is increasingly funded from retained earnings.

The analysis goes beyond the level of disaggregation possible using the flow-of-funds accounts by decomposing the firms sector by owership classification. This is done using alternate data sources, and allows for a Steindlian analysis in which investment and saving are unevenly distributed among the firms sector. It is argued that although the share of output accounted for by the state-owned sector is falling, the investment decisions of this sector are the crucial determining factor in generating output growth and aggregate investment.

A reinterpretation of Steindl's (1952) theoretical system is used in which the relative positions of the "cartelised" and "marginal" firms are reversed: rather than behaving as "parasitic" monopolists, the expenditures of the state-owned sector are increasingly captured as profits by private-sector firms.

The chapter is organised as follows. Section 6.2 presents an overview of the flow-of-funds accounts which provides some background to the original formulation of the accounts, plus a description of the basic construction of the accounts and the underlying principles. Section 6.3 outlines the sources of data used and highlights a number of issues with these data. Section 6.4 analyses the "physi-

cal transactions" side of the flow-of-funds accounts, focusing on the dynamics of investment and saving behaviour and the financial balances generated by the interaction of these decisions. Section 6.5 analyses the firms sector in greater detail, drawing on additional data sources to move beyond the aggregate data of the flow-of-funds to differentiate between enterprises of different ownership types.

6.2 Background to the flow-of-funds accounts

Origination of the flow-of-funds accounts is credited to Morris Copeland who in the 1940s published two papers (Copeland, 1947, 1949) on "moneyflows accounting", followed by a detailed study of *Moneyflows in the United States* in 1952 (Copeland, 1952). These writings put forward a systematic way in which to integrate, in a unified accounting framework, all real and financial transactions within an economic system. This accounting framework was presented as an alternative to the standard national accounts. Copeland's ideas were taken up by the Federal Reserve, which began publishing flow-of-funds accounts in 1955.

A simplified example flow-of-funds matrix is shown in Figure 6.1 The matrix depicts, at the aggregate level, the complete set of real and financial transactions in a closed system over a given time period. These transactions are classified either as 'sources' or 'uses' of funds.

The economic system is divided into three sectors: households, firms, and a unified banking system incorporating the central bank. The banking sector is assumed not to engage in any real transactions, but operates as a pure intermediary between the household and firm sectors.

The first two rows of the matrix contain the real income and expenditure of each sector, with the difference between the two recorded in the third row as net saving. The difference between this value and the level of real investment recorded in row four gives the net financial balance of any sector.

For the sake of simplicity, financial transactions in the matrix are limited to changes in the holdings of bank deposits and the issuance or repayment of loans taken out against the banking system. An increase in the holdings of deposits by households or firms corresponds to a use of funds by that sector, while the issuance of fresh liabilities in the form of increased borrowing is a source of funds. The inverse is the case for the banking system.

In order that the system retain internal consistency, the transactions that comprise the matrix must be constrained by a number of identities that ensure that

		Households		Firms		Bank		Total	
		Uses	Sources	Uses	Sources	Uses	Sources	Uses	Sources
Physical Transactions	1. Income		Y_h		Y_f				$Y_h + Y_f$
	2. Expenditure	E_h		E_f				$E_h + E_f$	
	3. Net Saving = $Y - E$		S_h		S_f				$S_h + S_f$
	4. Investment	I_h		I_f				$I_h + I_f$	
Financial Transactions	5. Change in Deposits	D_h		D_f			D	$D_h + D_f$	D
	6. Change in Loans		L_h		L_f	L		L	$L_h + L_f$
	$(S - I) - (D - L)$		0		0		0		

Table 6.1 – Simplified system of flow-of-funds accounts

two conditions are fulfilled. The first of these conditions is that the discrepancy between real saving and real investment—the net financial balance—for any given sector is exactly offset by a compensating change in the holdings of financial assets and issuance of liabilities. One identity per sector (represented by a column of the matrix) is obtained by setting the difference between real uses and sources to equal to the difference between financial sources and uses. These identities are implied by the zero totals at the bottom of each column.

The second constraint that must be imposed on the system is that, for each transaction type, total uses of funds must equal total sources. For real sector transactions this is equivalent to enforcing the Keynesian identity that saving must equal investment.[1] In the case of financial transactions this constraint ensures that any new issuance of a given type of financial liability is exactly matched by a corresponding increase in the holdings of that type of liability. One identity is obtained from each row in the Financial Transactions section of the matrix.

For the simple matrix shown in Figure 6.1, these constraints result in a total of six identities: one for each sector of the economy, one for each type of financial asset—loans and deposits—and one which is equivalent to the Keynesian identity that total real saving and investment must be equal:

$$S_h - I_h = D_h - L_h \tag{6.1}$$

$$S_f - I_f = D_f - L_f \tag{6.2}$$

$$D = L \tag{6.3}$$

$$S_h + S_f = I_h + I_f \tag{6.4}$$

$$D_h + D_f = D \tag{6.5}$$

$$L_h + L_f = L \tag{6.6}$$

Two important related points should be made about this system of identities. The first is that these identities will only necessarily hold *ex-post*. The second is that the system of equations derived from the identities of a flow-of-funds matrix will be over-determined: any single equation in the system is implied by the other remaining equations.

The connection between these points lies in the fact that they both relate to

[1] Income, Y, and expenditure, E, do not enter the identity directly because these are subsumed into net real saving, S.

the problem of imposing causality on the system of identities. Whilst saving and investment must be equal *ex-post*, the direction in which causation between the two runs depends on one's theoretical perspective. Likewise, given a collection of flow-of-funds identities, without imposing further assumptions on the system, we are faced with the problem that "everything depends on everything else" (Green & Murinde, 2000).

To illustrate using our simple model, Equation 6.1 states that any surplus occurring in the household sector, due to an excess of saving over investment $S_h - I_h$, will have its counterpart in a reduction in the difference between the sector's financial assets and liabilities $D_h - L_h$: if the household sector does not consume all of its real income, it will either be accumulating bank deposits or paying off loans.[2] For Equation 6.4, the Keynesian saving-investment identity, to be fulfilled, firms collectively must be running a deficit exactly equal to the surplus in the household sector. From Equation 6.2, financing this deficit requires that the difference between changes in assets and liabilities in the firm sector will be the inverse of the financial operations undertaken in the household sector: the firm sector will face a net increase in liabilities. Finally Equations 6.5 and 6.6 ensure that that, for each of the two financial instruments, total issuance of liabilities is equal to the total volume of purchases of the equivalent asset. These five equations collectively imply that the total increase in the level of deposits in the system is equal to the total increase in the level of loans. The remaining unused identity—the balance sheet of the banking system, Equation 6.3—is redundant.

The problem with analyses of this type is that they do not overcome the problem of causation. Although the exposition started from household saving and found the bank's balance sheet to be the redundant equation, the correct causal line runs from investment by firms, via new credit issued by the banking system, to the requirement that the household sector balances its books through net real saving.

Copeland (1952, p. 259) proposed a way to overcome this issue by using a classification of sectors based on the relative rates of change of real incomes and expenditures. Sectors are classified as either bulls, bears or sheep. Bulls are those deficit sectors for which real outlays (expenditure plus investment) are increasing faster than incomes, thus pushing the sector further into deficit. Conversely, bears are those surplus sectors for which the level of real outgoings are decreasing faster

[2]More precisely, the rate at which deposits are being accumulated will be higher than the rate of increase of loan liabilities.

than their incomes, so that the financial surplus of the sector is increasing. Those sectors which are neither bulls nor bears are classified as sheep. These are sectors that are reducing their financial position—either surplus or deficit—in each subsequent period. The real uses of funds by these sectors will increase less than sources in expansionary periods, and decrease less than sources in deflationary periods. They are thus "passive hoarders and dishoarders".

The underlying assumption made by Copeland in this classification system is that sectors have a greater ability to determine their expenditures than to determine than their incomes. The economic system is thus viewed as being driven by investment and consumption decisions, with saving determined as the residual. Those sectors for which expenditure is increasing faster than income are viewed as exerting expansionary pressure on the system, leading to monetary expansion and an increase in economic activity when these sectors are dominant. The opposite effect is observed when "bears" become the dominant sector, resulting in deflation and a reduction in economic activity.

This classification system is closely aligned with the Kaleckian theoretical framework in which investment financed via the creation of credit money generates additional saving, and the associated theories of distribution and accumulation. These theories were discussed and integrated within an abstract flow-of-funds system in Chapter 4. The resulting theoretical system thus closely matches the intended spirit of Copeland's concrete system of accounts.

6.3 Data sources and description

6.3.1 NBS Flow-of-funds accounts

The National Bureau of Statistics of China (NBS) has published flow-of-funds accounts since 1992. The accounts are usually published in the *Statistical Yearbook* dated three years after the year of the accounts. The most recent set of accounts are those for 2008, published in the 2011 *Statistical Yearbook* (NBS, 2011).

These accounts disaggregate the economy into five sectors: households, non-financial corporations, financial institutions, government and the rest of the world. As in the example used in the previous section, the accounts are divided into a set of "above the line" flows relating to physical transactions, and "below the line" flows resulting from financial transactions. The physical transaction tables are constructed by the NBS while the financial transactions tables are the responsibil-

ity of the Peoples' Banks of China (PBC).[3]

Since the difference between "physical" incomes and expenditures for each institutional sector is equal to the net financial balance of that sector, this magnitude should in theory be identical to the net acquisition of financial assets—to accommodate the difference between sources and uses of funds—for that sector in the financial flow-of-funds table.

Some degree of error is inevitable in compiling data-sets of this type, and this is reflected in the differences between the "net financial investment" figure of the physical tables and the corresponding figure in the financial tables. This discrepancy tended to be fairly minor in the earlier flow-of-funds accounts, but has increased significantly in recent years.[4] This is noted by an author at the NBS:

> Theoretically, the item of "net lending and borrowing" should be completely in line in the two tables. However, due to the data gap, many indicators need to be estimated or projected, these two "net lending and borrowing" are inconsistent in reality. From the data in recent years, the difference of this item between the two tables is getting bigger which is difficult to be explained by statistical error. (Xu et al., 2012, p. 16)

This problem is compounded by the fact that the physical flow-of-funds tables were revised as a result of the two economic censuses that took place in 2004 and 2008. Each census resulted in a benchmark revision to the official statistics, including the GDP figures. After the 2004 economic census, the figure for 2004 GDP was revised upwards by 16.8%; previous years were revised upwards in decreasing proportions back to the 1992 figure which was increased by 1.07%. A further benchmark revision took place in 2010 after the second economic census in 2008. This second revision resulted in upward adjustments to the GDP figures for 2005–2007. Table 6.2 compares the original GDP figures to the subsequently revised figures. The revised figures for the years 1992–2003 are from the first benchmark revision and those for the years 2004–2007 are from the second benchmark revision.

[3]The PBC has published a set of financial transactions accounts for 2009, but there is not yet a matching set of physical accounts from the NBS. The 2009 financial accounts will be used as an example where required for the discussion in this chapter.

[4]Until 2004, the physical transactions table included a "statistical discrepancy" item which adjusted the net financial investment position of each sector to match that of the financial transactions table. This was dropped from the accounts for years after 2004.

	Nominal GDP			% increase	
	Orig.	**2004 rev.**	**2008 rev.**	**2004 rev.**	**2008 rev.**
1992	26,638	26,923		1.07	
1993	34,634	35,334		2.02	
1994	46,759	48,198		3.08	
1995	58,478	60,794		3.96	
1996	67,885	71,177		4.85	
1997	74,463	78,973		6.06	
1998	78,345	84,402		7.73	
1999	82,067	89,677		9.27	
2000	89,468	99,215		10.89	
2001	97,315	109,655		12.68	
2002	105,172	120,333		14.41	
2003	117,390	135,823		15.70	
2004	136,876	159,878		16.81	
2005	183,217		184,937		0.94
2006	211,924		216,314		2.07
2007	257,306		265,810		3.31
2008	314,045				
2009	340,903				
2010	401,513				
2011	471,564				

Table 6.2 – Nominal GDP: original and revised figures from 2004 and 2008 benchmark revisions (10,000 yuan)

Source: National Bureau of Statistics, China (2005, 2007, 2010)

Both benchmark revisions included the generation of updated physical flow-of-funds tables to match the revised GDP figures. The first revision resulted in updated physical transaction tables for the period 1992–2004. These tables were published in *Data of Flow of Funds of China* (NBS, 2006a). The second revision produced a set of updated physical transaction tables for the years 2004–2007.[5]

The financial tables of the flow-of-funds accounts were *not* updated however, with the result that the discrepancy between the financial and physical accounts widened further in several cases.

The result of all of these revisions is that there is a selection of accounts to choose from when undertaking a flow-of-funds analysis. The approach taken

[5]There are therefore three different versions of the 2004 physical transactions table, despite the fact that GDP figure is the same in all of them. A table was included, as usual, in the 2007 *Statistical Yearbook* (NBS, 2007). A different version appeared in *Data of Flow of Funds of China* (NBS, 2006a). Finally, a revised version, produced after the 2008 economic census, was included in the 2010 *Statistical Yearbook* (NBS, 2010).

here is to use the most recently produced version of the accounts for each year. As noted above, the revised versions of the accounts have tended to introduce greater discrepancies between the per-sector net financial position in the physical and financial transaction tables. Table 6.3 shows these discrepancies between the net financial position of each sector in the physical and financial tables. This discrepancy is shown as as a percentage of GDP each year for both the original and revised flow-of-funds accounts.

The largest divergence between the tables is recorded in the original accounts for the years 2006 and 2007. In these years the discrepancy for the firms sector is over 12% of GDP in both cases, with large discrepancies recorded for other sectors also. The 2008 benchmark revision reduced these discrepancies significantly. While the 2008 revisions tended to reduce this discrepancy, the 2004 revisions had the opposite effect in many years, as can be seen by comparing "Total" column for the original accounts and the 2004 revisions. In particular, the discrepancy between the figures for the household sector and the firms sector tended to increase with this revision. These differences between the physical and financial transactions tables will be considered in more detail later on, but the point of the current discussion is to demonstrate that much of the divergence between the tables, at least for the years prior to 2004, was not present in earlier versions of the tables, and were introduced as result of data revisions.

6.3.2 Financial stocks and flows

The NBS flow-of-funds accounts combine financial institutions and the monetary authority—the PBC—into a single sector. This presents some difficulties in trying to isolate the effects of monetary policy on the balance sheets of the commercial banks. These problems are partially offset by the inclusion of items for "vault cash", "required reserves" and "loans from central bank" in the list of financial transactions. Since these flows are purely "internal" to the amalgamated financial system, sources tend to equal uses for these items.

In addition to these difficulties in separating the monetary authority from the commercial banks, the accounts provide information only on flow magnitudes, and not stocks. For the real-sector this does not present many problems since the only flow that results in real accumulation is investment. All other flows either result in consumption or saving in the form of financial assets. Thus the only stocks that are of significance—other than the stock of capital—are monetary or

	Non-Financial Firms			Financial Firms			Households		
	Orig.	Rev. 1	Rev. 2	Orig.	Rev. 1	Rev. 2	Orig.	Rev. 1	Rev. 2
1992	-0.2	1.8		-0.6	-0.8		-2.4	-1.2	
1993	0.0	1.3		0.1	-0.3		-0.3	0.9	
1994	0.3	2.7		-0.8	-1.2		0.7	2.1	
1995	0.3	1.7		-0.8	-1.5		0.5	2.5	
1996	-2.9	-2.2		2.4	1.8		-0.1	1.3	
1997	0.6	2.1		1.0	0.5		-0.6	0.0	
1998	1.3	0.9		0.0	0.0		-0.4	0.9	
1999	2.3	1.7		-1.6	-1.9		-0.4	1.1	
2000	1.3	0.0		-0.4	-0.4		1.2	1.7	
2001	2.0	0.1		-2.6	-2.5		1.4	1.0	
2002	1.5	-3.0		-0.3	-0.7		0.6	-0.2	
2003	1.1	-3.2		0.1	0.1		0.6	0.2	
2004	0.4	-1.1	6.0	0.2	0.2	-0.4	-0.1	1.4	-2.5
2005	3.6		1.1	-1.5		-2.1	0.6		0.2
2006	12.2		9.3	-2.1		-2.7	-3.8		-3.3
2007	12.7		7.5	6.9		6.1	-11.6		-7.8
2008	3.3		3.3	0.6		0.6	-3.7		-3.7

	Government			Rest of the World.			Total		
	Orig.	2004 rev.	2008 rev.	Orig.	2004 rev.	2008 rev.	Orig.	2004 rev.	2008 rev.
1992	0.4	2.5		0.0	0.0		-2.9	2.4	
1993	-0.1	2.7		-0.1	2.9		-0.4	7.5	
1994	-0.3	0.5		0.0	0.0		-0.1	4.2	
1995	0.1	1.2		0.0	0.0		0.1	4.0	
1996	1.2	3.3		0.0	0.0		0.7	4.2	
1997	0.3	0.1		-0.7	0.7		0.6	3.4	
1998	0.4	0.4		-0.4	0.3		0.8	2.5	
1999	0.6	0.2		-0.2	0.3		0.7	1.4	
2000	-2.1	-1.8		-0.1	0.0		-0.1	-0.5	
2001	0.6	0.8		-0.1	0.0		1.3	-0.6	
2002	1.2	0.8		-0.3	0.0		2.6	-3.0	
2003	-8.5	3.3		3.0	0.1		-3.7	0.4	
2004	-0.3	-0.3	-2.5	0.0	0.0	0.0	0.3	0.3	0.6
2005	0.4		2.0	-0.2		0.0	3.0		1.2
2006	-1.8		-0.6	0.1		0.1	4.6		2.7
2007	-6.9		-6.8	1.1		1.1	2.2		0.0
2008	0.6		0.6	-0.5		-0.5	0.3		0.3

Table 6.3 – Difference between *net financial position* of sectors in financial and physical transaction tables of both original and revised Flow of Funds accounts (percentage of GDP)

Source: NBS, 2005; NBS, 2006a; NBS, 2007; NBS, 2010

financial. Financial and monetary stocks are of particular significance in China due, for example, to the very large volumes of foreign exchange and credit money on the balance sheets of financial organisations.

For these reasons, in this following analysis, the NBC flow of funds accounts are augmented using balance sheets of the monetary authority and the aggregated financial system. This section outlines the structure of these balance sheets and describes the techniques used to ensure compatibility of these data with the flow-of-funds accounts.

The PBC has published monthly balance sheets from 2000 onwards as well as balance sheets for the aggregate financial system from 1996 onwards. By matching items on the two balance sheets, and netting those items on the aggregated FI balance sheet against the PBC balance sheet, a balance sheet for the financial system net of the PBC may be obtained. This balance sheet will be dominated by the Chinese commercial banks, although it will also include institutions such as insurance companies and pension funds.[6]

From the balance sheet of the PBC and the balance sheet of financial institutions net of the PBC, annual flows may be inferred from the changes to the level of stocks. These flows may be compared with those shown in the flow-of-funds accounts in order to determine how closely the flow-of-funds accounts match the balance sheets published by the PBC.

Table 6.4 shows a rearranged version of the simplified balance sheet of the PBC included in Section 5.3.1. This balance sheet is included at this stage primarily for the purpose of demonstrating the assumptions required to obtain the balance sheet of the financial system net of the monetary authority, but a number of features are worth highlighting. Firstly, the balance sheet is completely dominated by foreign exchange holdings, as would be expected given the PBC policy of intervening to stabilise the exchange rate. The only other items of significance on the asset side are "Claims on government", and claims on financial institutions as a whole, which are of a similar magnitude. "Claims on government" is likely to be composed primarily of holdings of government bonds—however, this item is more than offset by government deposits on the liability side. Claims on finan-

[6]The PBC has recently starting publishing "Banking Survey" and "Other Depository Corporations" balance sheets, in line with the standards of the IMF International Financial Statistics, but these have not been published over a long enough period to use for the current analysis. Further, the "Other Depository Corporations" balance sheet, which is closest to what is aimed at here, appears not to be a gross, rather than net balance sheet: it includes "Claims on other Depository Corporations" as well as recording holdings of central bank bills which significantly exceed the amount recorded as issued by the PBC balance sheet.

Assets		Liabilities	
Foreign exchange	175,155	Currency issue	41,555
Monetary gold	667		
Other foreign assets	9,509		
Claims on other depository corporations	7,162	Deposits of financial corporations	102,429
Claims on other financial corporations	11,530		
		Bond issues	42,064
Claims on government	15,662	Deposits of government	21,226
Other assets	7,845	Other liabilities	20,256
Total	227,530	**Total**	227,530

Table 6.4 – Balance sheet of PBC, December 2009, (100,000 yuan)

Source: PBC

cial institutions are likely to be the result of advances of reserves to institutions in open-market operations. This item is relatively small and is completely dwarfed by the deposits of financial corporations—by far the largest item on the liability side. The size of this item is due in part to the level of reserve requirements imposed by the PBC, however Chinese banks also tend to hold reserves in excess of these requirements.

The largest item on the liability side of the balance sheets of central banks of advanced economies is generally currency issue. This is not the case in China: not only is the volume of bank reserves greater than the volume of currency in circulation, bond issuance also slightly exceeds currency issue. Again this is due to the sterilisation of current account imbalances as detailed in Section 5.3.1.

Turning now to the financial system as a whole, Table 6.5 shows a simplified version of the "Sources and uses of credit funds of financial institutions" table for December 2009, published by the PBC. This table provides an summary of the aggregate balance sheet of the Chinese financial system as a whole.

The first thing to note about this balance sheet is its size relative to that of the PBC: the PBC balance sheet accounts for around one third of the total size of the aggregate financial system. This is again primarily the result of reserve accumulation. The asset side of the balance sheet is dominated by loans of various

Uses		Sources	
Industrial loans, s.t.	38,769	Enterprise deposits	217,110
Commercial loans, s.t.	19,483	Fiscal deposits	22,411
Other short-term loans	88,359	Deposits by govt. orgs.	29,560
Loans, medium & l.t.	222,419	Household savings deposits	260,772
Other loans	30,655	Other deposits	67,888
Portfolio investment	86,643	Bonds	16,203
Foreign exchange	193,112	Currency in circulation	38,246
Other assets	2,771	Other liabilities	30,022
Total	679,103	Total	679,103

Table 6.5 – Sources and uses of credit funds of financial institutions, December 2009 (100,000 yuan)

Source: PBC

types along with these foreign exchange reserves. The volume of loans is around twice that of foreign exchange reserves. In addition there is an entry "Portfolio Investment" which is around half the size of foreign exchange reserves and about one quarter the volume of loans. This entry is made up of holdings of securities such as bonds and equities, and may be concentrated in non-bank financial institutions.

On the liability side, the balance sheet is completely dominated by deposits—these make up around RMB60tn. of the the total size of the balance sheet of RMB 68tn. In addition to these deposits are a small volume of bonds and a larger volume of circulating currency. Chinese banks are bound by regulations which stipulate loan-to-deposit ratios of 75 percent, and an even lower ratio for the large state banks. It was reported in 2012 that this requirement is to be relaxed since it is restraining the ability of banks to lend (Reuters, 2012a).

The composition of the aggregate balance sheet of the Chinese financial system is strongly affected by the volume of accumulated foreign exchange reserves. It is possible to view these reserves as a form of monetary "base" upon which the credit system rests. In advanced economies the banking system—as distinct from other financial institutions—generally represents a much smaller proportion of the aggregate financial balance sheet than is the case in China. On the balance sheets of those banks, deposits will generally provide the funding for only some portion of total assets, rather then exceeding non-FX assets as is the case in China.

Assets		Liabilities	
S.t. industrial loans	38,769	Enterprise deposits	217,110
S.t. commercial loans	19,483	Household savings deposits	260,772
Other short-term loans	88,359	Govt. deposits	30,745
Medium & l.t. loans	222,419	Other deposits	67,888
Other loans	30,655		
Reserves with CB	102,429	Liabilities to CB	18,692
Vault cash	3,310		
Bond holdings	25,861		
Portfolio investments	86,643		
Foreign assets	9,544	Other liabilities	28,923
Total	627,471	Total	624,129

Table 6.6 – Assets and liabilities of financial system net of PBC, December 2009 (100,000 yuan)

Source: PBC and own calculation

In advanced economies, these deposits are usually backed by a small fractional reserve of liabilities of the central bank. In China, almost a third of deposits are backed directly by holdings of foreign exchange.

In order to analyse the mechanisms by which this configuration is maintained, it will be useful to isolate the balance sheet of the financial system from that of the monetary authority. This is done by netting the items on the PBC balance sheet against the aggregate balance sheet of the financial system. The resulting balance sheet of the financial system net of the monetary authority is shown in Table 6.6. This table was produced as follows:

Firstly, the various types of loans, securities holdings and deposits of the commercial banking system were carried over directly from the aggregate financial system balance sheet. Reserves with the central bank are obtained from the item "deposits of financial corporations" on the PBC balance sheet, while liabilities to the central bank are obtained by adding the two items "claims on financial corporations" and "claims on depository corporations" from the asset side of the PBC balance sheet. Vault cash is determined by subtracting the volume of currency in circulation from currency issued by the PBC. Holdings of foreign exchange outside the PBC is obtained similarly by subtracting total FX holdings from those held at the PBC. Finally, bond holdings of the financial system is a net figure obtained by subtracting the volume of bonds issued as liabilities by the financial

system as a whole, from the volume issued by the central bank: the difference should give the volume of central bank bonds held by the banking system as a whole, although this should be seen as a net figure because commercial banks may also issue some bonds of their own. In addition, a number of items of small magnitudes on each balance sheet have been aggregated into the category "other liabilities"

The resulting balance sheet in Table 6.6 requires a number of assumptions to be made about the accounting categories of the aggregate balance sheet of the financial system and the PBC balance sheet. The plausibility of these assumptions is supported by the fact that the total assets and liabilities of the balance sheet generated are close in magnitude, despite the composition and construction each side being different. Having generated such balance sheets for the period 2000–2009 (the PBC first began publishing balance sheets in 2000), it seems reasonable to conclude that these provide a good representation of the aggregate financial system balance, net of the monetary authority.

The final task required for integration with the flow-of-funds accounts is to convert the balance sheets of the PBC and the financial system from stocks to flows, and to compare these flow values with those of the financial institutions sector in the flow-of-funds accounts.

This is done using Tables 6.7 and 6.8. Table 6.7 shows the Financial Transactions of the flow-of-funds table for 2009. The order of the table has been rearranged slightly from the original published by the NBS, but the contents are identical, as are the five institutional sectors. Table 6.8 shows the same set of accounts, but in this case the financial institutions sector has been replaced with two sectors, the monetary authority and financial institutions excluding the monetary authority. The figures for these two sectors have been replaced using flow values calculated from the balance sheets of the PBC and the balance sheet of the financial institutions net of the PBC. By comparing the values in these two tables, it will be possible to determine how closely aligned the financial balance sheets and the flow-of-funds are.

The compatibility between these two sets of accounts will show up in particular in the differences between total sources and uses of funds for each item on the sheet. In the original in Table 6.7, the construction of the accounts is such that total sources and uses are exactly equal for each item.

The tables are divided into four sections horizontally. The first section contains total uses and sources for each sector. The next two sectors contain trans-

	Non-financial Firms		Financial Institutions		General Government		Households		The Rest of the World	
	Uses	Sources	Uses	Sources	Uses	Sources	Uses	Sources	Uses	Sources
Net Financial Investment	-25,326		2,066		8,264		35,907		-20,911	
Financial Uses	75,031		170,913		19,651		60,796		6,300	
Financial Sources		100,357		168,847		11,387		24,889		27,211
Currency Issue	364			4,046	81		3,358		243	
Deposits	65,916		3,713	132,764	19,591		43,160		383	
Loans		78,990	107,619	441		107		24,889	256	3,448
Securities	-184	16,810	25,301	4,786	-40	8,182	4,507		193	
Changes in Reserve Assets			27,216							27,216
Required and Excess Reserves			11,507	11,507						
Cash in Vault			416	416						
Central Bank Loans			-1,589	-1,589						
Investment Funds	-5		-166	-1,206	-1		-1,035			
Deposits with Margin Securities Trading Account	2,545		1,370	6,272			2,356			
Insurance Technical Reserves	395			5,864		2,927	8,396			
Inter-financial Institutions Accounts			1,165	6,312					617	-4,530
Foreign Direct Investment	2,999	5,341							5,341	2,999
Changes in Other Foreign Assets and Debts	3,717	2,190	-5,640	25		26			2,241	-1,922
Errors and Omissions in the Balance of Payments		-2,975							-2,975	
Miscellaneous (net)	-717			-788	20	146	54			

Table 6.7 – Flow of funds, financial transaction table, 2009 (100,000 yuan)

Source NBS, 2011

	Non-financial Firms		Monetary Authority		Financial Institutions (net)		General Government		Households		The Rest of the World	
	Uses	Sources	Uses	Sources	Uses	Sources	Uses	Sources	Uses	Sources	Uses	Sources
Net Financial Investment	-25,326				-1,515		8,264		35,907		-20,911	
Financial Uses	75,031		20,434		132,016		19,651		60,796		6,300	
Financial Sources		100,357		20,434		130,501		11,387		24,889		27,211
Currency Issue	364			4,440	413		81		3,358		243	
Government Deposits				4,263		7,706	19,591					
Deposits	65,916			0		119,570			43,160		383	
Loans		78,990			96,290			107		24,889	256	3,448
Securities	-184	16,810			21,341		-40	8,182	4,507		193	
Changes in FX Reserves			22,789		2,176							27,216
Required and Excess Reserves				10,323	10,323							
Bonds				-3,716	933							
Central Bank Loans			-1,593			-1,593						
Investment Funds	-5						-1		-1,035			
Deposits with Margin Securities Trading Account	2,545								2,356			
Insurance Technical Reserves	395							2,927	8,396			
Inter-financial Institutions Accounts											617	-4,530
Foreign Direct Investment	2,999	5,341									5,341	2,999
Changes in Other Foreign Assets and Debts	3,717	2,190						26			2,241	-1,922
Errors and Omissions in the Balance of Payments		-2,975									-2,975	
Miscellaneous (net)	-717		-228	5,096		12,524	20	146	54			

Table 6.8 – Flow of funds, financial transactions table augmented with PBC balance sheet data, 2009 (100,000 yuan).

Source: NBS, PBC, own calculation

actions that more or less exactly match items from the financial sector balance sheets. The second section contains transactions that primarily take place between the financial and non-financial sectors, such as loans, deposits and so on. In this section, one additional item has been added—government deposits—since these are recorded separated on the financial system balance sheets.

The third section contains transactions that occur internally in the financial system. In the original flow-of-funds accounts, no intra-sectoral transactions take place in this section of the table, implying that sources and uses are identical for each transaction type. In the updated table, all transactions in this part of the table take place between the financial system and the monetary authority. The final section of the table contains transactions between the financial system and the non-financial sectors that are not readily mapped onto the items of the financial balance sheets, and thus contains the more problematic items.

Comparing Table 6.7 to Table 6.8, the first items of interest are contained in the second section of the table, starting with currency issue. These currency figures match very closely across the two tables. The next three items of Table 6.8 do not match quite as well but are still close to the original figures. In particular, the figures for loans and non-government deposits are both around one million yuan lower than the corresponding figures in Table 6.7.

Of the intra-financial-sector transactions in the third section, both central bank reserves and advances match very closely, however central bank bond issuance shows a higher discrepancy. Since the bond "sources" figure of the monetary authority is negative, this represents net purchases, reversing previous sterilisation and increasing the liquidity of the financial system. The difference between sales by the PBC, and purchases by the banking system is around three million yuan. It is probable that in the Table 6.7, these bond sales are included in the item "securities". [7]

Finally, the bottom section of the tables contains those items that cannot be easily matched against the balance sheets of the PBC and financial institutions. These items include claims on non-bank financial intermediaries such as insurance and investment funds. These items are relatively small in magnitude, but

[7] The majority of central bank sterilisation bonds are held by the commercial banks: net bond issuance of the PBC at the end 2009 was around 4.2 trillion yuan, while net bond issuance of financial institutions as a whole was only around 1.6 trillion yuan, suggesting that around 2.6 trillion yuan of these bonds have remained within the banking system. This still leaves 1.6 trillion yuan of bonds held outside the financial system, but based on the flow-of-funds accounts there doesn't appear to be any way of determining where this stock is held. Finally, the introduction of transaction categories relating to new non-bank financial investments further.

are becoming more significant in recent years.

To further complicate the issue of integration with the PBC accounts, certain items only began to feature in the accounts in recent years. Both "deposits with margin securities trading accounts", and "investment funds" were only introduced as categories in 2006. These items have shown some interesting dynamics since their introduction, and will be discussed in greater detail later on.

In conclusion, while problems remain with integrating financial stocks and flows to create a fully coherent set of accounts, for the majority of bank-intermediated items, such as loans and deposits, the two sets of accounts appear to be closely aligned. The same is true of monetary policy instruments, with the exception of central bank bond issuance. A number of recently introduced non-bank financial instruments are also difficult to reconcile with the stock accounts. These findings are consistent across the other years for which balance sheet data are available.

6.4 Saving and Investment

This section provides a detailed analysis of the real sector flows that have combined to produce China's spectacular growth. The dynamics of income, expenditures, saving and investment are examined for each sector. Although it is impossible to impose unequivocal causal relationships onto the data series, it is argued that the configuration of real-sector flows is strongly suggestive of an endogenous credit-financed investment-led growth path, in line with the theoretical analysis of Chapter 4. Although the saving of households is high, it will be shown that, in macroeconomic terms, households may plausibly be regarded as the passive actors, while growth is driven by the investment expenditures of firms.

The analysis will work from the aggregate macroeconomic level down to the sector level at progressive stages of greater disaggregation. Figure 6.1 shows total volumes of saving and investment at the national level in China.[8] The volume of investment is extremely high, peaking at around 45% of GDP in 1993 before falling steadily by around ten percentage points to a low of around 35% in 2000. Over this period, total saving remained fairly constant at around 37–38%. From 2000 onwards, both saving and investment have risen steadily, although saving has risen faster, with investment reaching its previous peak of around 44% by

[8] All of the figures in this section are derived from the most recent revisions of the physical transactions tables of the flow-of-funds accounts, unless stated otherwise.

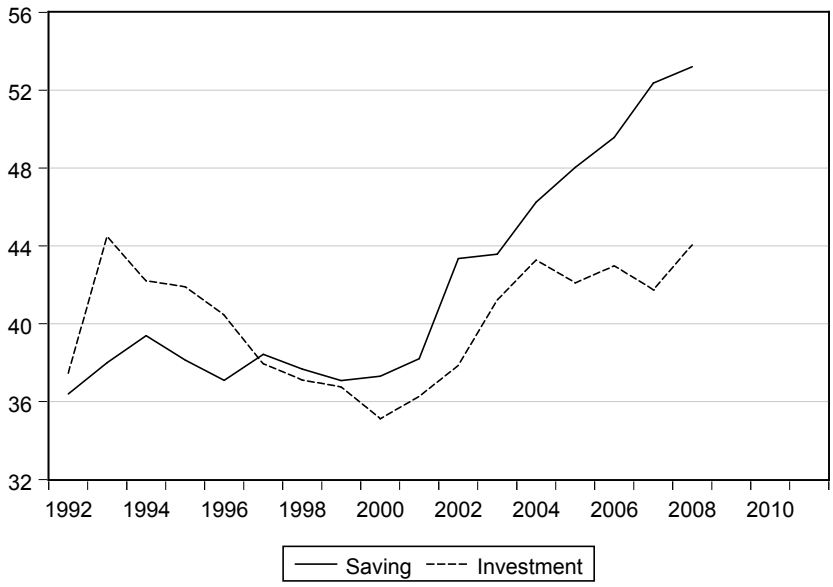


Figure 6.1 – Saving and investment, percentage of GDP

Source: NBS, own calculation

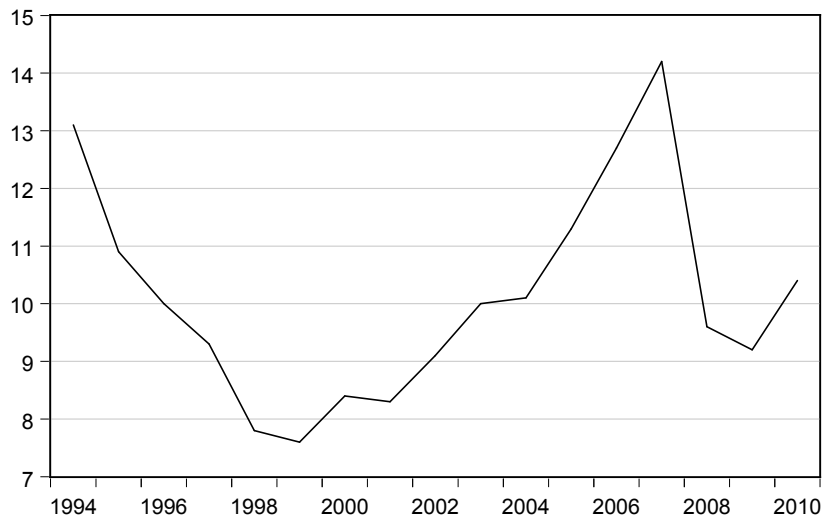


Figure 6.2 – Growth rate of real GDP

Source: NBS, own calculation

2008, while saving exceeded 50% in 2007.

Figure 6.2 shows the rate of growth of real GDP over a period extended by two years at the end of the range. The share of investment in GDP and the growth rate of GDP have followed a closely aligned path, at least until 2004. After 2004, the share of investment in GDP flattened out, while saving continued to increase as a share of GDP.

This excess of saving over investment is reflected in the trade balance, as shown in Figure 6.3. This figure is not generated from the flow-of-funds accounts, but shows the official volumes of exports and imports from NBS balance of payments data. The trade balance implied by these figures differs somewhat from that obtained from the flow-of-funds which only include a figure for net exports.

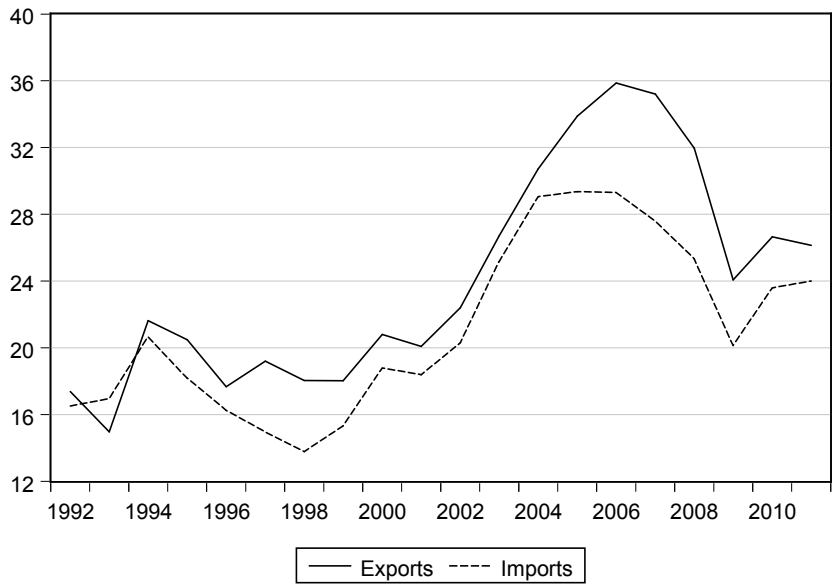


Figure 6.3 – Exports and imports, percentage of GDP

Source: NBS, own calculation

6.4.1 Saving

The high total level of saving in China is spread across the institutional sectors, although the proportion assigned to each sector—firms, households and governments—depends in part on assumptions regarding the classification of

	Firms		Households		Government
	cur.	cap.	prod.	non-prod.	
Consumption	47,625		83,543	-110,595	-12,063
Investment	138,325	-95,648		-27,432	-15,065
Wages	-67,533		-55,052	150,512	-23,156
Property income	-5,181			7,419	-1,254
Net taxes and transfer payments	-51,072			1,459	62,698
Gross saving	-62,164	62,164	35,910	48,795	26,225
Capital transfer		3,163			-2,951
Net aquisition of capital assets		-7,685		4,073	3,612
Net saving		65,327	28,491	48,795	23,275
Net financial balance		-38,006		41,376	11,822

Table 6.9 – Simplified physical transactions table of flow-of-funds accounts 2008, units: 100,000 yuan

Source: NBS, own calculation

income-redistributing flows such as taxes, social security spending and capital transfers.

This point is illustrated using Table 6.9, which contains a simplified and rearranged version of the physical flow-of-funds accounts for 2008. Three institutional sectors are included: firms, households and the government, while the foreign sector and the financial system are excluded for the sake of simplicity. The firm sector has been divided into a current and capital account, as in the transactions flow matrices used in Chapters 3 and 4.[9] In this simplified set of accounts, "sources" and "uses" of funds are represented by positive and negative values respectively.

The household sector, under the classification system used by the NBS, is not only a recipient of wages and other income but also generates value added and acts as a source of labour demand and therefore wage income. This productive activity is likely to be largely agricultural, informal, self-employment and so on. To account for production by households, the sector is divided into "productive" and "non-productive" sub-sectors. The productive sector receives income in the form of consumption spending, and expends funds on wage labour. The non-

[9]The key assumption used to generate this table is that investment goods are only produced in the firms' sector, while consumption goods are produced by both the household sector and the firms sectors. This allows the flow-of-funds to be presented in a form in which the circular flow is fully captured. This assumption is only introduced for the purposed of presentation of a simplified set of accounts, and is not retained in the more detailed analysis later in the chapter.

productive sector represents households in the pure accounting sense, such that income takes the form of wages and property income (primarily interest and rent payments), which is spent mostly on consumption, as well as some investment on housing and other consumer durables. Finally, the government sector consumption is a net figure: since the government generates a small share of national value added, it also functions as a producer. This value added is netted against government consumption, such that the figure in the table is only that consumption that is not produced by the government, and thus generates an inter-sectoral flow.

The table is divided horizontally into three sections, each containing a group of "physical" transactions flows. Expenditures are represented by negative figures and incomes by positive figures. The first section contains those items that are the components of GDP by expenditure: consumption and investment. Consumption expenditures originate with the non-productive household sector and the government sector and accrue as income in the current accounts of firms and the productive household sectors. Investment expenditures originate with spending by governments firms and households and generate income for the firm sector. Total GDP is thus the sum of total investment and consumption expenditures (abstracting from the sectors not shown).

The next category of transactions contains wage and property income, as well as net tax and social security payments. In the simple pure-credit economy described in Chapter 3 in which the government sector was assumed away, the current account of the firm could be used to infer profits, and thus the distribution of income, directly from income and expenditure flows,

$$C + I = Y = W + r_L \cdot L + S_F$$

where W is wage payments, $r_L \cdot L$ is property income and S_F is the saving of firms, or profits. In the absence of government taxation and expenditure, profits could be derived by subtracting firms' current expenditures from current income:

$$S_F = (C + I) - (W + r_L \cdot L)$$

This same calculation may be used in the current case to obtain a "pre-tax profits" figure for the firms' sector, but can no longer provide a pure distribution of income between wages and profits since some proportion of revenue for firms is the result of government spending on consumption and investment, which is

in turn funded at least in part by appropriation of a share of that income.

In Table 6.9, the gross saving figure—representing retained profits for the firms sector—is thus calculated net of tax deductions and payments. These tax payments are in turn calculated as net of social security expenditure in the case of households with the result that net taxes is a source of income for government and households, and a deduction from the income of firms.

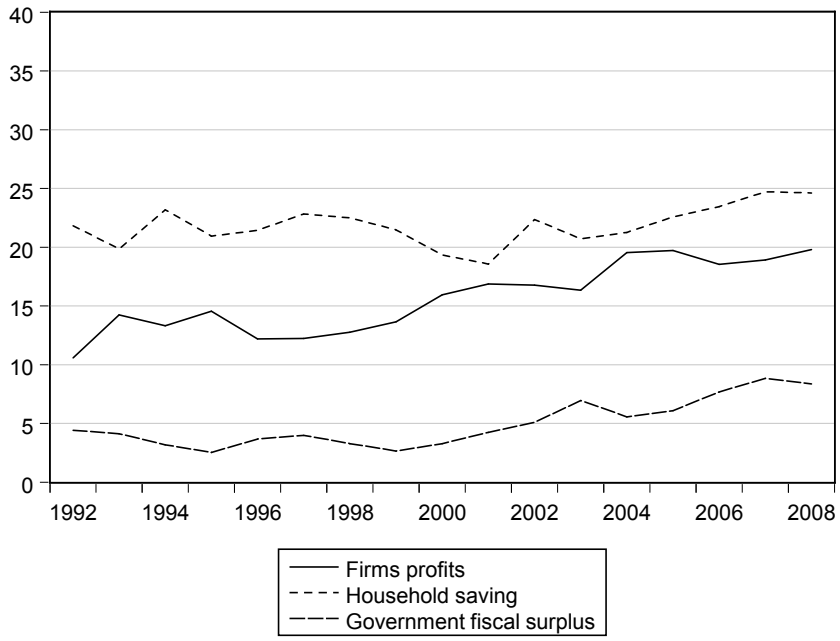


Figure 6.4 – Saving by sector

Source: NBS, own calculation

The evolution over time of this gross saving figure for each of the three sectors is shown in Figure 6.4. The saving of each of the three sectors has increased over the period shown, although the increase is greatest in the retained earnings of the firm sector. Figure 6.1 shows that total saving remained almost flat up until around 2001. From Figure 6.4 it can be seen that this was because movements in household saving and firms' profits tended to offset one another: as firms profits increased over the period 1997–2001, household saving fell by a similar amount. Over the second half of the period, however, the saving of all three sectors rose steadily.

Table 6.9 shows that in 2008 firms were the primary source of tax revenues, while households were net recipients of fiscal transfers. Figure 6.5 shows the distribution of taxation and transfer payments over the three sectors for the full period of analysis. The pattern has remained fairly steady over this period: firms provide the major source of fiscal revenue, with the tax liabilities of firms remaining fairly constant at around 15% of GDP. At the same time, the position of households as net beneficiaries of fiscal transfers has declined while governments have increased their tax revenues from a low of around 15% of GDP to a maximum of 20% of GDP in 2007 and 2008.

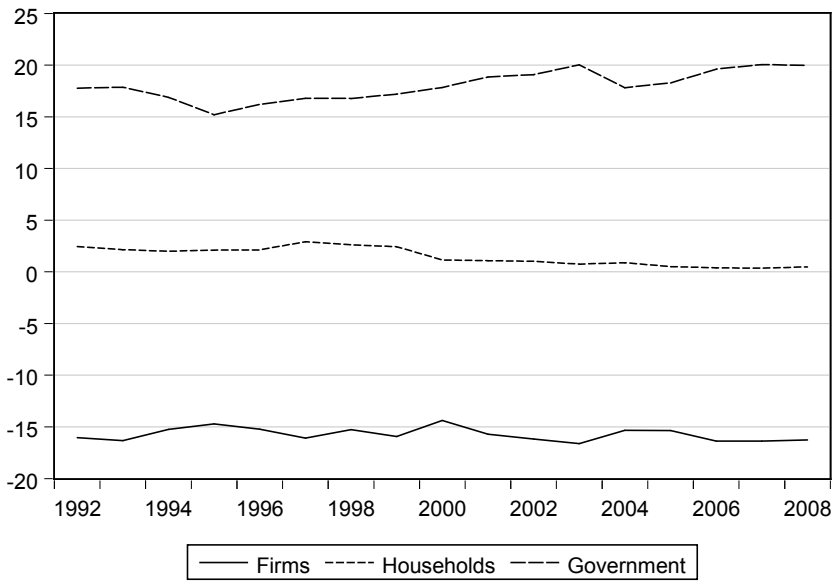


Figure 6.5 – Net tax and transfer payments by sector

Source: NBS, own calculation

By subtracting the net tax and current income figure from gross saving, it is possible to obtain a pre-tax profit figure for firms and a saving figure for households net of taxes. While it is impossible to isolate the effects of taxation and government transfer payments on saving and expenditure due the aggregate demand effects of such policy, this gives some indication of relative levels of saving in the firms and household sectors before fiscal transfers. These pre-fiscal-transfer saving magnitudes are shown in Figure 6.6. Removing fiscal transfer payments from the picture reverses the relative positions of firms and the household sector:

Firms' saving is more than 5% higher than that of households in 1992 rising to more than 10% higher in 2008 at over 35% of GDP. While care must be taken in drawing conclusions from this exercise since in the absence of these fiscal transfers, consumption and investment expenditures would be different, it seems clear that the saving of households is not the key driver of high aggregate saving in China.

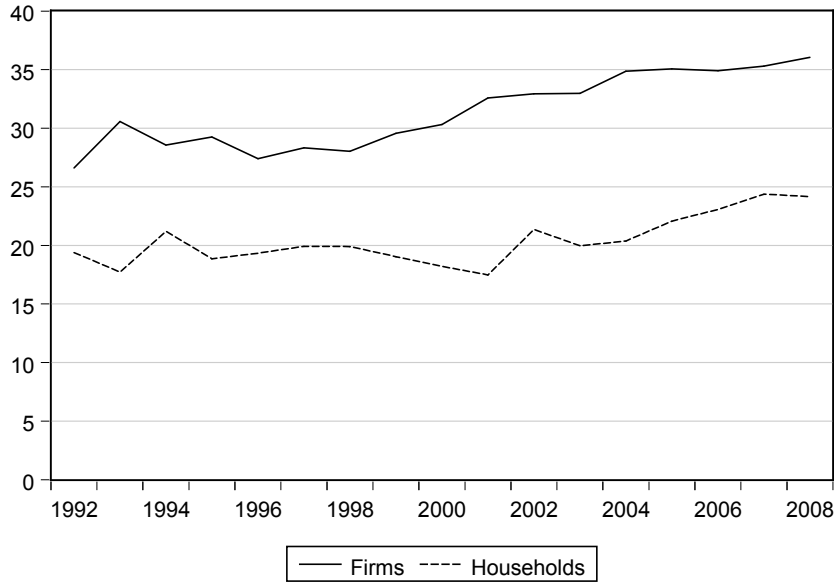


Figure 6.6 – Saving of households and firms net of taxes and fiscal transfers

Source: NBS, own calculation

The next item on the flow-of-funds accounts shown in Table 6.9 is "Capital transfer". This category is defined by the NBS as follows:

> Capital Transfer refers to the free payment from one sector to another sector of non-financial investment capital, and is a transaction that seeks no return from the recipient. Capital transfer differs from current transfer in 2 aspects: 1) The purpose of the capital transfer is investment rather than consumption. 2) Capital transfer features the transfer of the ownership of assets other than inventory and cash, and capital transfer in its monetary form involves the disposal of assets other than inventory. Capital transfer includes investment subsidies

and other capital transfers. (NBS, 2011)

This transfer gives rise to a flow in the reverse direction from that of net taxation in that it is a redistribution of assets from the government sector to the firms sector. Once this is added to the figure for gross saving, a final value for the saving of each sector is obtained. This is shown in Figure 6.7

After taxes, fiscal transfers and capital transfers, government sector saving was close to zero until around 2000, after which time it increased steadily to around 7.5% of GDP. The gap between firms' households saving narrowed until 2001 when firms saving briefly overtook household saving. For the remainder of the period, household saving increased steadily to a level of around 25% of GDP. It is clear from the above analysis that this understates the true level of profit in the firms' sector: the very high tax deductions from firms' earnings reduces the final saving figure substantially. This revenue is used to fund government current expenditures and transfer payments, as well as, from around 2000 onwards, saving by the government sector.

Table 6.9 shows that, in 2008, taxation on the firm sector amounted to around RMB 5.1tn, compared to wage costs of around RMB 6.6tn. Taxes equalled more than 75% of wage costs. Of this taxation, around half, RMB 2.3tn, was directed towards wage payments by the government sector.

6.4.2 Investment

The analysis of the previous section gave a detailed breakdown of saving by sector in the Chinese economy and showed that household saving, while significant, cannot be regarded as the key factor driving high national saving rates. The focus now switches to the investment expenditures of each sector. The analysis of investment is more straightforward since the majority of investment expenditures are undertaken by the firms sector, and there are less complications in the form of transfer payments. Once the investment and saving of each sector are determined, the difference between the two volumes is equal to the net financial balance of that sector. The net financial balance of each sector is the key variable which connects the physical transactions analysed in this chapter with the financial transactions analysed in the subsequent chapter.

Referring back to Table 6.9, the net saving of the firms' sector was around RMB 6.5tn. in 2008. Once investment expenditures of RMB 9.6tn. are subtracted from

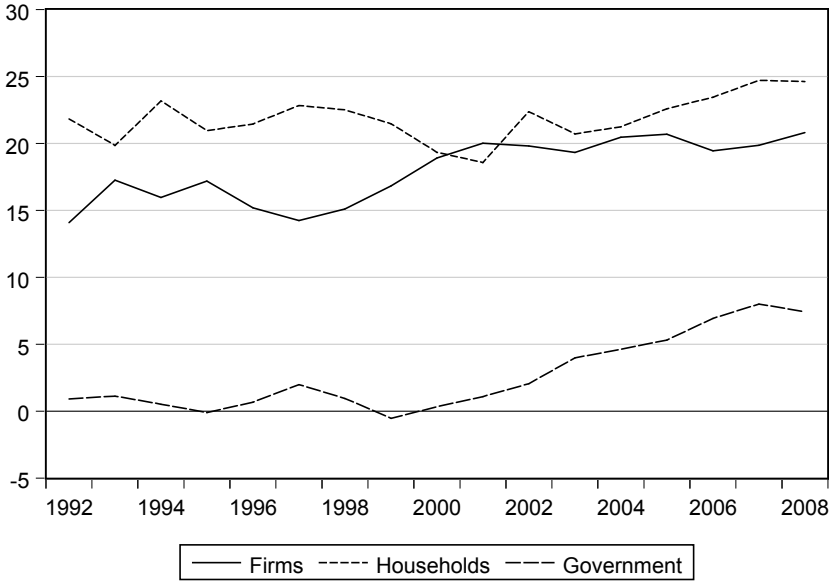


Figure 6.7 – Saving by sector after capital transfers

Source: NBS, own calculation

this figure, the net financial position of the firm sector shows a deficit of around RMB 3tn.

A final additional item included in Table 6.9 is "Net acquisitions of capital assets". This item refers to the transfer of ownership of already-existing capital goods between sectors. It may thus be regarded as contributing to net capital investment from the point of view of any individual sector, although at the aggregate level it only represents a redistribution of ownership. Once this figure of RMB 7.7tn. is added to the investment figure above, the final net deficit position of RMB 3.8tn. is obtained. This is the amount that firms are thus required to finance through the net issuance of new financial liabilities.

The item "Net acquisitions of capital assets" is a new category which was only introduced to the the flow-of-funds accounts in 2004. It therefore has no influence on the investment position of sectors prior to this point.

Figure 6.8 shows the investment expenditures of each sector. Figure 6.8a excludes inter-sector capital asset purchases, while it is included in Figure 6.8b. This inter-sectoral transfer of capital assets serves to offset what appears to be a rise

in the investment expenditure of households and the government from around 2002, and maintains the trend for a widening gap between the investment expenditures of firms and households. The net investment position of firms' in Figure 6.8b shows a steady rise in investment expenditure from around 2000 back to levels close to the 1993 peak of 35% of GDP.

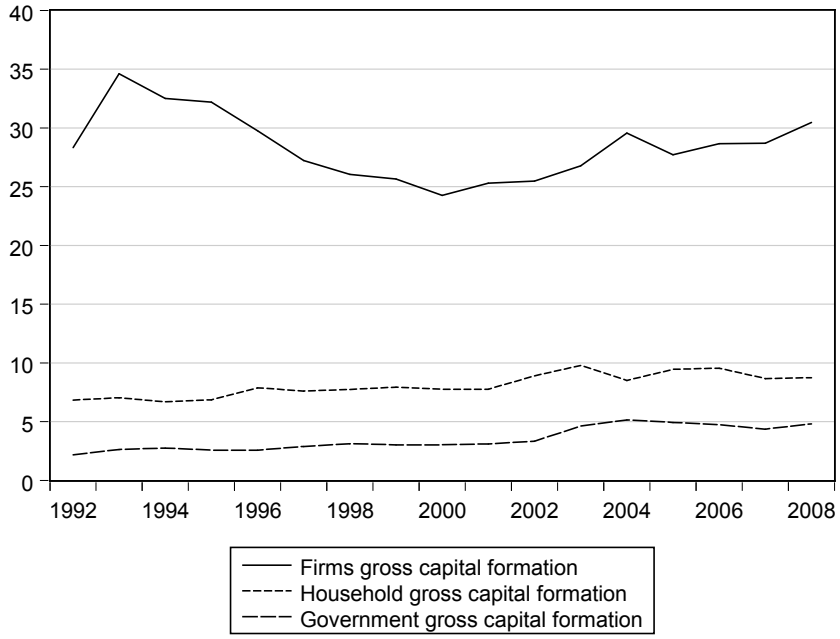
6.4.3 Net financial balances

So far, the evolution of saving and investment have been examined individually on a sector by sector basis. These are now combined in an analysis of the net financial position of each sector. This type of analysis is best known known in the form of the "three balances" approach of Godley and Cripps. (1976; 1983), and the closely related "twin deficits" hypothesis.

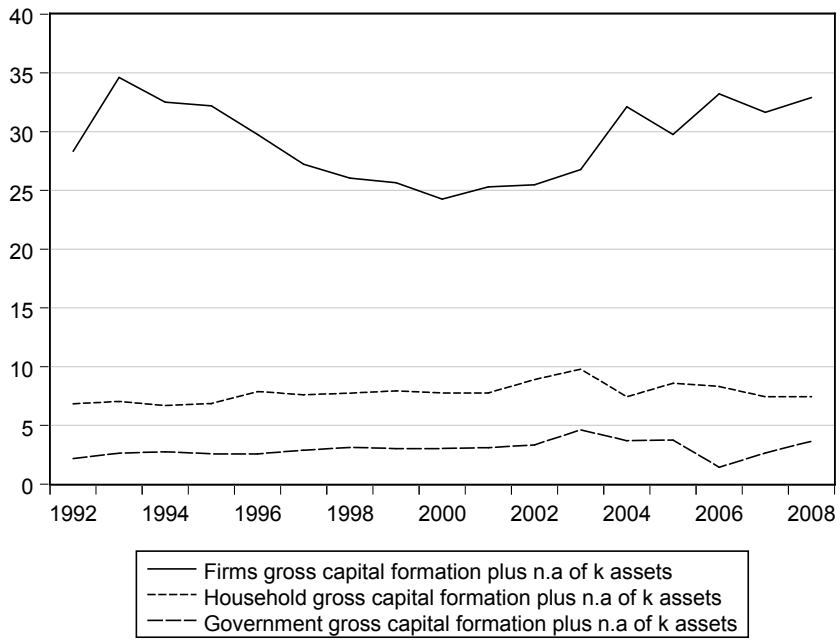
The "three balances" system arose out of the observation that in the UK post-war period, the government deficit and the trade deficit tended to be very closely linked. From this observation came the Cripps-Godley hypothesis that the private sector financial balance tends to be small, positive and stable. This, it was argued, is because of the behavioural tendency of the private sector to aim for a stable ratio of income to savings—a behavioural stock-flow norm. If this hypothesis correctly describes private sector behaviour, the implication is that that expansionary fiscal policy will not be matched by increased output—due for example to higher profits in the firm sector providing a stimulus to investment—but will only result in an increase in the trade deficit. This hypothesis was central to the criticisms of the activist fiscal policies of the time that were levelled by Godley, Cripps and other members of the Cambridge Economic Policy Group (Maloney, 2012).

However, since the "three balances" approach only relies on accounting identities—and is thus always true *ex post*—there is no need for it to remain linked with the hypothesis of a stable private sector net balance (dos Santos, 2010). Nonetheless, as was shown in Chapter 4 in relation to the work of Steindl (1952) in particular, it is the internal dynamics of the private sector that are key in determining whether an economy tends towards growth or stagnation.[10] In particular, it is the relative saving propensities of households, large monopolistic firms and smaller "marginal" firms that combine to determine the rate of accumulation.

[10]Godley and Cripps themselves pointed out that "their adjustment mechanism is only consistent with a constant level of income because the path becomes unstable when growth is endogenous" (Shaikh, 2012, p. 130)



(a) Gross capital formation



(b) Gross capital formation plus net acquisition of capital assets.

Figure 6.8 – Investment by sector

Source: NBS, own calculation

The "three balances" alone are therefore limited in their analytical power without further disaggregation of the private sector and the firms' sector in particular.

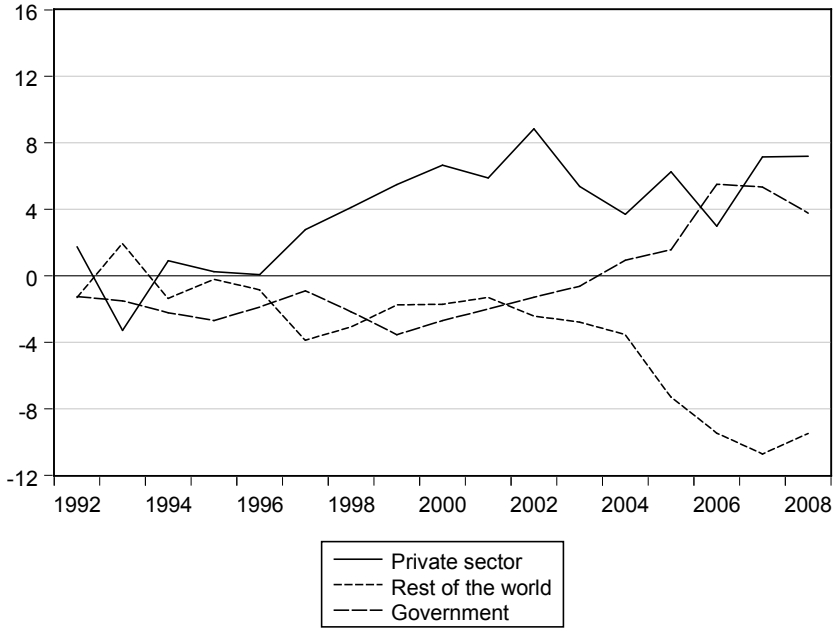
The Chinese "three balances"—the net financial position of the private sector,[11] government sector and household sector—are shown in Figure 6.9. The balances in the figure are calculated in two different ways: firstly from the physical transactions table (Fig. 6.9a) and secondly from the financial transactions table (Fig. 6.9b). As was discussed in Section 6.3.1, the net financial position of the sectors in the physical tables does not match up exactly with the same figure in the financial tables, a problem that has become more apparent in recent years. This issue can be seen clearly in Figure 6.9. While the path of the "Rest of the World" series is almost identical in both cases, there are significant differences between the private sector and government positions across the two methods of calculation. In recent years, the surplus that has resulted as the trade balance has widened appears to accrue primarily in the private sector according to the calculation based on the financial tables: other than a small surplus briefly in 2005–06, the government has maintained a deficit over this period. In the physical transactions accounts, the government registers a surplus from 2004 onwards, and the private sector surplus is correspondingly reduced, peaking at 7% of GDP, rather than 12% according to the physical transaction tables. These discrepancies in the government financial position are examined in more detail in the following section.

Despite these contradictions in the data concerning the government position, the broad picture is fairly clear. A rising trade surplus has been matched by a surplus in the "private sector", while the government has either run a small deficit, or moved from deficit into surplus in more recent years.

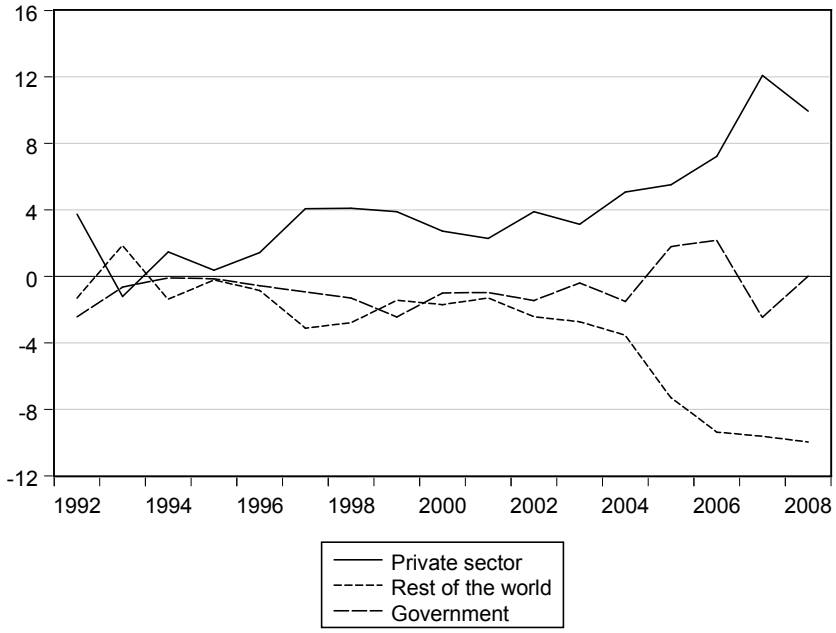
Further disaggregation of the "private sector" is required in order to determine the relative positions of the firm and households sectors. This is done in Figure 6.4, which shows the net financial balances of the four domestic sectors, while the external position has been removed for the sake of clarity. Once again, the net financial position of each sector has been calculated from both the physical and financial tables, so that the difference between the two sets of accounts is visible.

In both figures, the firms sector is shown to be running a deficit of around

[11] An additional problem arises with the naming of the sectors in a mixed economy like China: much of the firms sector and most of the financial institutions sector are state-owned, so referring to the "private sector" is misleading. It is used here as shorthand for the firms', households and financial institutions sectors combined.



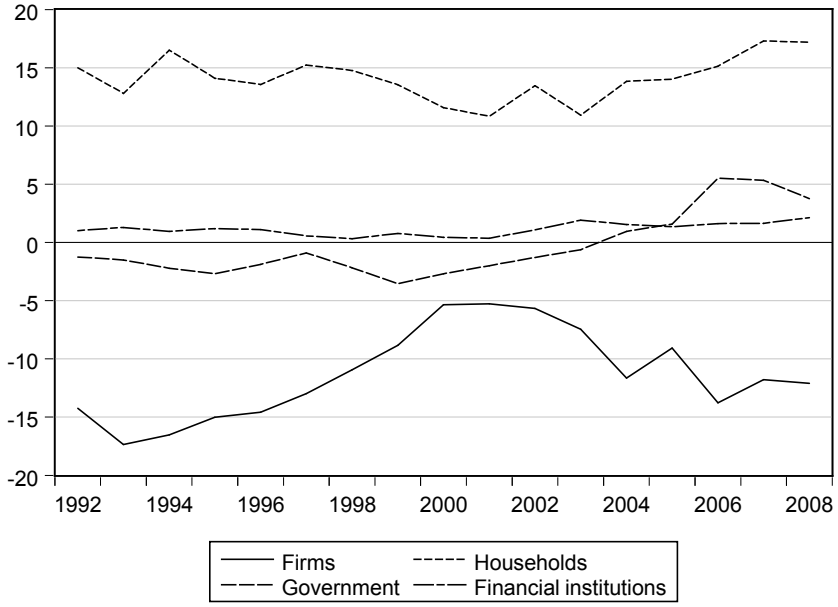
(a) From physical transaction tables



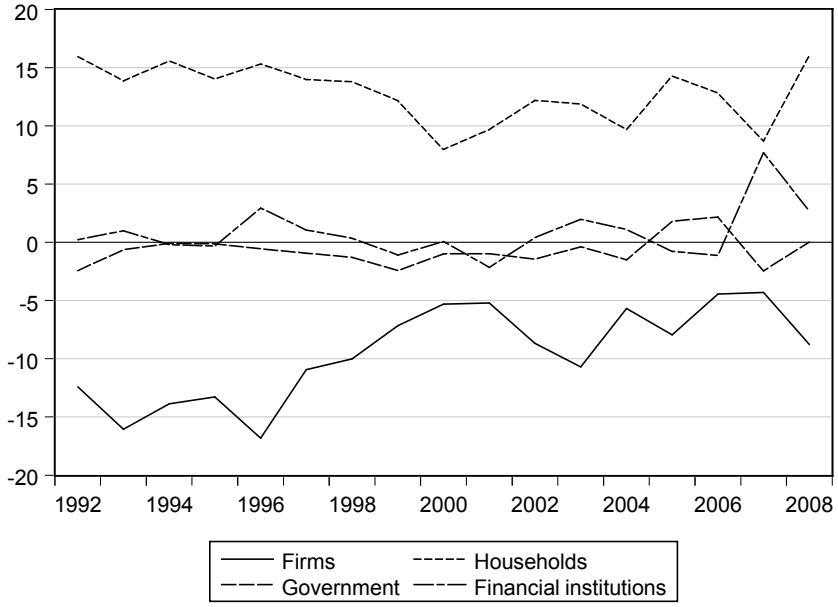
(b) From financial transaction tables

Figure 6.9 – "Three balances", percent of GDP

Source: NBS, own calculation



(a) From physical transaction tables



(b) From financial transaction tables

Figure 6.10 – Net financial position by sector, percent of GDP

Source: NBS, own calculation

15% of GDP in the early 1990s which is gradually reduced to around 5% of GDP by the turn of the decade. This deficit is matched almost exactly by household net saving, which also funds the moderate government deficit. The picture is less clear over the second decade, since the two sets of accounts are less coherent over this period. The deficit of the firm sector appears to increase again, although this is more marked in the physical transaction tables. This deterioration in the firm sector financial position shown in the physical transaction tables is related to the rise in investment expenditures as a share of GDP over the period of analysis. Figure 6.8 showed that firms' investment outlays followed a U-shaped pattern, falling from a high of around 35% of GDP to a low point around the turn of the century, before rising again back towards the 35% mark.

Over this period firms' saving—retained earnings—rose steadily. The combination of a slowing rate of investment, with rising profits, meant an improvement in firms' financial position. After 2000, investment growth increased again without profits keeping up, pushing firms back into deficit.

Finally, the financial position of the financial institutions sector was close to balance over the period—as would be expected—with the exception of the year 2007 in the financial accounts when the financial sector appears to move sharply into surplus, matched by a sharp drop in the position of households. The causes of this jump—and the reliability of the data—will be discussed in Chapter 7 on the financial sector.

6.4.4 Income and expenditure shares

The previous sections undertook a detailed examination of the levels of saving and investment in the Chinese economy, their distribution across institutional sectors, and the resulting net financial balances of each sector. This analysis gives a good indication of the broad dynamics of the macroeconomic interactions of sectors—in Copeland's original analysis, those sectors which are moving further into deficit are the "bulls" which are driving economic growth, while "bears" are those sectors for which the opposite is the case. (1952, p. 259).

Something that may not be fully captured through such an analysis is the possibility of shifts in the relative weight of the various institutional sectors, both in terms of income and expenditure. In particular, incomes and levels of consumption may move together within sectors, leaving saving, investment, and net financial balances unchanged. An example of this would be a shift in income dis-

tribution from households to the government sector through increased taxation of income. If the government were to spend all of the addition revenue, while households cut back consumption by the same amount, the composition of aggregate demand would be altered while the net financial balances of the system would remain unchanged.

Furthermore, without knowing the relative income shares of the various sectors, it is difficult to determine the causes of changes in the distribution of saving and financial balances. An increase in the level of saving of a particular sector may either be due to an increase in the propensity to save of the sector with unchanged income, or to an increase in income with an unchanged propensity to save. Both would be likely to result in an improvement in the net financial balance of the sector, but the effects on output growth would differ. In the former case, all else being equal, a fall in the rate of growth would be expected, due to lower aggregate demand. While most analyses of China's saving have focused on saving propensities, it is the effect of changing income distribution that is emphasised by Steindl—the relative protection of the incomes of the middle classes implies that with a fall in output, those incomes tend not to fall as much as those of other households, thus increasing the share in output of the middle classes and both the share of saving by that sector, and the overall "saving propensity" in the economy.

In this section, an attempt is made to determine the relative shares of income of the three main economic sectors. This presents some difficulties since the income of the government sector is largely composed of revenues which have been deducted from the incomes of other sectors. For this reason, incomes before and after tax are calculated for the household and firms' sectors.

Government income and expenditures

The analysis first examines the incomes and expenditures of the government. As was shown in the previous section, the flow-of-funds accounts contain some discrepancies regarding the level of the government net deficit. As well as the government accounts in the the flow-of-funds, the NBS also publishes separate figures on government revenue and expenditures. These figures are shown in Table 6.10 as a share of GDP. Since the figures were not revised in line with the increases in the GDP that were retrospectively applied in 2004 and 2008 (see Table 6.2), some inaccuracy is to be expected, such that the figures will not be directly

comparable to the those derived from the flow-of-funds accounts. According to these accounts, however, the government remained in deficit over the entire period, with the exception of 2007, a difference which cannot be attributed directly to inaccuracies relating to the GDP adjustments.

Regardless of these accounting issues, what these figures suggest is a steadily rising share of government income and expenditure in the economy, while the budget balance remained negative but close to zero.[12]

	Revenue				
	Tax	Other	Total	Expenditure	Balance
1992	12.2	0.7	12.9	13.9	-1.0
1993	12.0	0.3	12.3	13.1	-0.8
1994	10.6	0.2	10.8	12.0	-1.2
1995	9.9	0.3	10.3	11.2	-1.0
1996	9.7	0.7	10.4	11.2	-0.7
1997	10.4	0.5	11.0	11.7	-0.7
1998	11.0	0.7	11.7	12.8	-1.1
1999	11.9	0.8	12.8	14.7	-1.9
2000	12.7	0.8	13.5	16.0	-2.5
2001	14.0	1.0	14.9	17.2	-2.3
2002	14.7	1.1	15.7	18.3	-2.6
2003	14.7	1.3	16.0	18.1	-2.2
2004	15.1	1.4	16.5	17.8	-1.3
2005	15.6	1.6	17.1	18.3	-1.2
2006	16.1	1.8	17.9	18.7	-0.8
2007	17.2	2.1	19.3	18.7	0.6
2008	17.3	2.3	19.5	19.9	-0.4
2009	17.4	2.6	20.1	22.3	-2.3
2010	18.3	2.5	20.8	22.5	-1.7

Table 6.10 – Government revenue and expenditure, official NBS figures, percent of GDP.

Source: NBS, 2011

An alternate set of government financial accounts may be obtained from the flow-of-funds accounts. These are shown in Table 6.11. This table contains some detail on the composition of income and expenditure: income is divided into tax revenue and non-tax revenue, which includes value added generated by the government sector. The expenditure side is divided into transfer payments such

[12] IMF estimates of the government fiscal position generally claim that the government has been in deficit over most of the period of analysis and that the deficit is larger than the figure recorded in the official statistics.

	Income			Expenditure					
	Tax	Other	Total	Trans.	Other	Total	Saving	Inv.	Bal.
1992	20.7	11.6	32.3	2.8	28.6	31.4	0.9	2.2	-1.3
1993	20.5	10.3	30.8	2.5	27.2	29.7	1.1	2.6	-1.5
1994	19.3	9.2	28.5	2.3	25.7	28.0	0.5	2.7	-2.2
1995	17.6	8.1	25.7	2.3	23.6	25.8	-0.1	2.6	-2.7
1996	18.6	7.5	26.2	2.3	23.2	25.5	0.7	2.6	-1.9
1997	19.6	7.6	27.2	2.7	22.5	25.2	2.0	2.9	-0.9
1998	20.3	8.3	28.7	3.4	24.3	27.7	0.9	3.1	-2.2
1999	20.2	8.4	28.6	2.9	26.2	29.2	-0.5	3.0	-3.6
2000	21.0	8.1	29.1	3.0	25.7	28.7	0.3	3.0	-2.7
2001	22.5	8.6	31.1	3.6	26.5	30.0	1.1	3.1	-2.0
2002	23.4	9.7	33.1	4.2	26.9	31.1	2.0	3.3	-1.3
2003	23.9	10.2	34.1	3.7	26.4	30.1	4.0	4.6	-0.6
2004	22.6	9.4	32.0	4.5	22.8	27.4	4.6	5.1	-0.5
2005	22.9	9.6	32.5	4.4	22.8	27.2	5.3	4.9	0.4
2006	24.4	9.6	34.0	4.6	22.5	27.1	6.9	4.7	2.2
2007	24.9	9.7	34.6	4.7	22.0	26.6	8.0	4.4	3.6
2008	25.2	10.0	35.2	5.1	22.7	27.8	7.4	4.8	2.6

Table 6.11 – Government revenue and expenditure, calculated from flow-of-funds, percent of GDP

Source: NBS, 2011

as social security spending, and other expenditures which includes wage payments, consumption and capital transfers. The difference between income and expenditure gives the saving of the government sector as in Figure 6.7. The net financial balance is thus equal to that previously calculated from the physical flow-of-funds accounts.

The shares of total income and expenditure shown in this table are much higher than those taken from the NBS Government Finance accounts. Tax revenues alone exceed total revenues from the Government Finance tables in every year. This may be partly due to netting of tax revenues in the Government Finance tables: the figures calculated from the flow-of-funds accounts use gross figures for all revenues. In addition, foreign interest receipts are excluded from the figures in Table 6.10.[13] Nonetheless, the difference in relative size of the government between the two sets of accounts is very large: in 2008 total government

[13]The notes to the Government Finance table in the 2011 *Statistical Yearbook* state that 'Government revenue does not include the receipts of domestic and foreign debts" and "government expenditures include the interest payment on domestic and foreign debts since 2000".

incomes added up to 35% of GDP according to the flow-of-funds accounts, 15% of GDP more than the figure for government revenues in Table 6.10.

A further point upon which the two sets of accounts are contradictory is on the relative paths of government incomes and expenditures. While both sets of accounts show the government taking a steadily rising share of the national income, the accounts offer diverge when it comes to government expenditures: the Government Finance figures show expenditures also rising steadily, leading to the almost-balanced fiscal stance. The figures calculated from the flow-of-funds show government expenditures falling slightly over the period. Even after investment is included, which rises slightly, the overall fiscal balance improves from a -3.6% deficit in 1999 to a surplus of 3.6% in 2007.

Income shares by sector

Calculating the shares of income of each sector, and thus rates of saving, presents difficulties due to the fact that the income of the government sector is primarily a deduction from the income of other sectors. The question this poses is whether income shares should be calculated before or after tax revenues have been deducted. If income shares are calculated before tax revenues are deducted, a "pure" income distribution between households and firms can be obtained, but the income share of the government will be much too low. If income shares are calculated subsequent to taxation, the government share of income will be realistic, but the shares of firms and households will be affected by the relative rates of taxation on those sectors.

In order to deal with this issue, three different measures are presented here, capturing pre-tax and post-tax income shares, as well as an intermediate calculation. The first case simply shows the share of value-added generated in each sector. Since total value-added sums to total GDP, this is equivalent to obtaining the share of total production that takes place under the ownership of each sector.

Secondly, a measurement is obtained of the relative shares of primary income. Primary income in the Chinese flow-of-funds accounts is obtained by including wage, interest and dividend payments out of value added, as well as taxes on production. This measure does not include income taxes or social security payments. Finally, the relative shares in disposable income are calculated. Disposable income is equal to primary income net of income taxes, social security and other current transfer payments by the government. Disposable income thus equates

to retained earnings in the case of firms and net after-tax income in the case of households. For the government, disposable income is equal to total revenues less transfer payments, before spending on goods, services and investment.

The share of each sector in each of the three measures of income are shown in Table 6.12. The shares in total value added are as would be expected—the majority of production taking place in the firms sector with the share rising moderately across the period, while the share of household sector production declines.

	Value added			Primary Income			Disposable Income		
	Firms	Govt.	H.holds	Firms	Govt.	H.holds	Firms	Govt.	H.holds
1992	53.9	11.3	30.0	14.9	16.6	66.1	10.6	20.0	68.5
1993	58.0	10.0	27.3	17.6	17.3	62.5	14.2	19.6	64.6
1994	57.6	8.8	28.9	16.1	17.0	65.0	13.3	18.5	67.0
1995	59.5	7.9	28.0	17.3	15.0	64.2	14.5	16.3	66.3
1996	58.4	7.3	29.8	15.1	16.4	65.5	12.2	17.7	67.6
1997	58.1	7.4	30.0	15.7	16.9	65.3	12.2	18.2	68.2
1998	56.8	8.0	30.8	15.3	17.5	65.0	12.8	17.9	67.6
1999	56.2	8.2	31.3	16.6	16.9	64.2	13.6	17.9	66.6
2000	55.8	7.9	32.2	18.1	17.4	62.6	15.9	19.1	63.8
2001	57.2	8.3	30.6	19.3	18.2	60.4	16.9	20.3	61.5
2002	58.1	9.5	28.6	18.8	18.9	59.9	16.8	21.0	60.9
2003	57.4	9.9	29.0	18.7	19.3	59.4	16.3	22.1	60.2
2004	59.6	9.1	27.9	21.8	16.9	59.5	19.5	19.5	60.4
2005	59.5	9.3	27.9	21.7	17.5	59.6	19.7	20.4	60.1
2006	59.3	9.2	27.8	21.3	18.0	59.3	18.5	21.8	59.7
2007	58.7	9.1	27.5	21.5	18.4	58.6	18.9	22.3	58.9
2008	59.2	9.5	26.6	22.5	17.6	57.6	19.8	21.6	58.1

Table 6.12 – Sector shares in total income, calculated from flow-of-funds, percent of GDP

Source: NBS, 2011

A more interesting pattern is observed in the relative shares of primary income. Once costs in the form of wages and production taxes have been paid, firms profits have steadily increased over the period, as has already been established. However, while the share of the government in the primary income distribution has remained close to constant, the rising share of firms' profits has been accommodated by a significant decline in household incomes, from a maximum of 66% of primary income in 1993, to a low of 58% in 2008. This fall in the income share of households is not necessarily a pre-requisite for the rising profit share of

firms, due to the increasing surplus on current account. It would be possible for rising firm profits to accrue entirely as a counterpart to the external surplus, with no change to household income. This is not the case here.

Finally, the per-sector shares of disposable income are calculated. The difference between primary income and disposable income captures the net effects of government income taxes and transfer payments. The result of these flows is a redistribution from the retained earnings of firms—the sector which pays the largest share of income tax—towards the government sector and, to a lesser extent, households, since transfer payments to the household sector exceed income tax paid by the sector. While relative shares of disposable income are thus shifted in favour of the government and households at the expense of firms, the trend over the period remains the same as that observed in shares of primary income: firms have almost doubled their share of disposable income from 11% to 20% of GDP, while household disposable income has fallen by the same amount from 69% of GDP to 58%.

It is now possible to connect the volumes of saving analysed in Section 6.4.1 with the income shares derived in the current section. This will allow the estimation of a "saving propensity" for each sector. This is done by calculating the proportion of the share of disposable income represented by the total saving of each sector. The measure of saving used for this calculation is that shown in Figure 6.4—the net saving of each sector before capital transfers take place. The ratio of saving to disposable income in percentage terms is shown in Table 6.13.[14]

An interesting story emerges from this table. The first point to note is that the share of profits saved by firms exceeds 100% from 2005 onwards. This is because net distributed profits turn negative in 2005 as a result of receipts of distributed earnings received from overseas subsidiaries. The very low proportion of profits that are distributed in China is a well-rehearsed fact (Lardy, 2006). The key point however, is the remarkable rise in the share of disposable income saved by both the household and government sectors. What makes this particularly surprising in the case of the household sector is that a significant increase in the proportion of income being saved has taken place over a period in which household's income as a share of the total has been falling. What is even more remarkable is that this period of rising saving in the household sector, even as the share in income is

[14]The "saving propensity" of firms determines the relative proportions of retained earnings to distributed profits. Since, in the NBS accounts, distributed profits have already been subtracted from disposable income, these are added back on to the total before the proportion of saving is calculated.

	Households	Firms	Government
1992	31.8	99.9	4.5
1993	30.7	99.5	5.6
1994	34.6	99.0	2.7
1995	31.6	91.0	-0.7
1996	31.7	89.5	3.8
1997	33.5	90.7	10.8
1998	33.3	88.3	5.2
1999	32.2	90.8	-3.0
2000	30.3	89.6	1.7
2001	30.2	90.1	5.3
2002	36.7	92.8	9.7
2003	34.4	96.1	18.0
2004	35.2	97.8	23.7
2005	37.5	100.9	26.0
2006	39.3	101.5	31.8
2007	41.9	102.1	35.7
2008	42.4	101.0	34.2

Table 6.13 – Saving as share of disposable income by sector, percent

Source: NBS, 2011

declining, is that for much of this period—from 1997 to 2007—GDP growth rates were rising steadily.

6.5 Firms sector in more detail

Up until this point, the analysis has treated the firms sector as a aggregate bloc. This is problematic in a system such as China's in which firms fall into a number of quite distinct groups. The influence of the the state-owned sector is—by most measures—falling in significance. Nonetheless, the Chinese economy remains centred on a core of large, protected, state-owned firms, concentrated in capital-intensive industrial production. Around this state-owned core is a growing "fringe" of privately-owned firms which are primarily oriented towards domestic demand for lower-capital intensity production such as consumer items. Finally there is a large export-oriented sector, clustered to an extent in designated "special economic zones" in which foreign capital investment plays a significant role.

In this section, an attempt is made to get beyond the aggregated figures of

the flow-of-funds accounts and examine the dynamics of accumulation in these different strata of the firms sector. The analysis concentrates primarily on the domestically-oriented sectors—the state-owned corporations and the private sector. In part this is due to the fact that these two sectors are likely to be more individually homogeneous than the foreign sector, in terms of such indicators as profit margins, capital intensity and capacity utilisation.

Within the export sector, a range of firm types is observed, from low-tech, primarily domestically owned companies exporting low-value-added manufactures to higher-tech, high-value-added exporters in which foreign investment and equity stakes play more significant role.

From the perspective of Steindlian and Kaleckian theory, it is hard to reconcile the observation of high and rising growth rates with a sharp decline in consumption expenditures. The evidence presented in this chapter suggests both a decreasing share of income accruing to those sectors with a relatively low saving-propensity—the household and government sectors—*and* an increase in the propensity to save in those sectors. Steindl's explanation for the stagnation of the US economy in the inter-war period was that "the economy is unable to adjust to low growth rates because its savings propensity is adjusted to a high one" (1979, p. 1). For Steindl, this "stickiness" of the propensity to save arises both because of shifts in the distribution of income towards those households which tend to save a significant share of their income—the middle classes—and because, with the increasing monopolisation of the corporate sector, the saving propensity of firms tends to rise as a consequence of a diminished sensitivity to excess capacity.

The analysis so far appears to show that the saving propensity of the household sector in the aggregate has risen significantly over the period of analysis. What is not clear at this stage is whether this is due to a change in the behaviour of households, or to a shift in income distribution *within* the household sector towards those households that tend to save more.

Also remaining to be analysed are the internal dynamics of the firms sector. In Steindl's analysis, the increasing inelasticity of profit margins in the "cartelised" sector causes an excessive share of profits to accrue to these firms at the expense of those "marginal" firms in the competitive fringe. At the same time, the increase in excess capacity provides a disincentive to investment, exerting a further depressing force on growth.

It is clear that any such disinventive to investment has yet to materialise in China. Despite the rising rate of saving, investment growth has remained strong

enough to maintain increasing rates of growth—at least until the shock to aggregate demand from the drop in external trade that was caused by the global crisis that began in 2007.

The analysis thus attempts to examine the relative strength of investment demand from each of the corporate sectors of the Chinese economy, as well the share of saving taking place in each sector, along with a number of measures of the profit margin and profit rate.

6.5.1 Investment by ownership classification

This section examines investment in more detail within the firms sector as well as examining the sources of funding for this investment. NBS statistics contain two sources that may be used for this analysis. Firstly, the official sources provide annual figures for "investment in fixed assets". These figures include a comprehensive breakdown of the distribution of capital expenditures across different types of firm ownership, as well as detailing the relative weights of the different financing sources used in this investment. Secondly, the GDP by expenditure accounts include a component "gross fixed capital formation". These figures are the basis for the construction of the real side of the flow-of-funds accounts. The gross fixed capital formation figures can be used in conjunction with the flow-of-funds tables to construct an account of distribution of investment expenditures across the sectors, as well as the financing of that investment. Since the GFCF figures are a principle component of the calculation of total GDP, these figures should allow for direct comparisons as a proportion of total output.

The first problem thrown up by this exercise is that the figures for "investment in fixed assets" and those for "gross fixed capital formation" are incompatible. While the investment in fixed assets series is presented as capturing investment "economy wide", it is unlikely that all investment is covered in this series (Holz, 2006). This is due in part to the fact that the coverage of the data has changed over time.[15] The scope of the statistics also differs: gross fixed capital formation contains a number items in addition to investment in fixed capital assets, including

[15]The details are given by Holz: "For example, investment by certain ownership groups has to be of a particular size before it is included in the statistics; this size criterion was raised in 1997. Or, prior to 1999, urban private and individual-owned non-real-estate investment is not included in the statistics. Second, some types of investment appear to be excluded from the statistics until today. For example, non-real-estate investment of a value below 500,000 yuan RMB is not included in the statistics except if by state- owned units, rural collective-owned enterprises, or individuals." (2006, p. 153)

"value-added created in the sale of real estate".[16] A further distinction arises because the figures for investment in fixed assets includes a separate series for "total investment in fixed assets" and "newly increased value of fixed assets". This captures the difference between expenditure on investment and delivery of finished capital equipment—the difference between A and D in Kalecki's system of variables. In addition to the lags involved in the production of investment goods, the difference between investment expenditures and finished capital goods may also be accounted for by waste, inefficiency, appropriation of funds and so on. This also allows for the calculation of a "transfer rate": the proportion of investment expenditure each year that does not immediately translate into new capital goods.[17]

Figure 6.11 shows the three series under discussion as a percentage of GDP over the thirty year period from 1981 to 2011. The figure illustrates the dangers involved in the careless use of such data series for econometric testing: over the period from 1985 to around 2003, "investment in fixed assets" and "gross fixed capital formation" track each other very closely, remaining within one percentage point of GDP. However, in 1981, GFCF was 40% greater than investment in fixed assets, while by 2010 GFCF accounts for only 66% of investment in fixed assets. As described above, GFCF contains a number of expenditure categories over and above investment in fixed assets. This makes it easier to explain the period in which GFCF exceeds investment in fixed assets than the later period when it is lower.

Since GFCF is a key component of the GDP figures, it seems reasonable to regard it the more accurate of the two measures. This view is reinforced when the values taken by the respective series as shares of output are considered. The peak at 70 percent of GDP for investment in fixed assets is plainly implausible. If GFCF

[16]"According to the GDP Manual 2001, pp. 92–95, 106f., gross fixed capital formation in the expenditure approach to the calculation of GDP comprises (i) 'total society investment in fixed assets' (this is economy-wide investment), (ii) value-added created in the sale of real estate, (iii) fixed assets created in the prospecting for mineral resources (*kuangcang kantan*, valued at 75% of costs), and (iv) fixed assets created in the improvement of land (unless already included in total investment of society), less three items. The three items to be subtracted are (a) the purchase of old structures (*jianzhuwu*), old equipment (*shebei*), and land, (b) other items in 'other costs' (*qita feiyong*) which do not constitute fixed asset investment, and (c) investment in afforestation, unless these numbers are very small and not easy to obtain, in which case they can be ignored." (Holz, 2006, p. 153)

[17]One further issue arises in comparing these data series in that the GDP by expenditure figures and thus the gross capital formation figures were revised upwards after the 2004 and 2008 economic censuses. The investment in fixed assets figures were not adjusted.

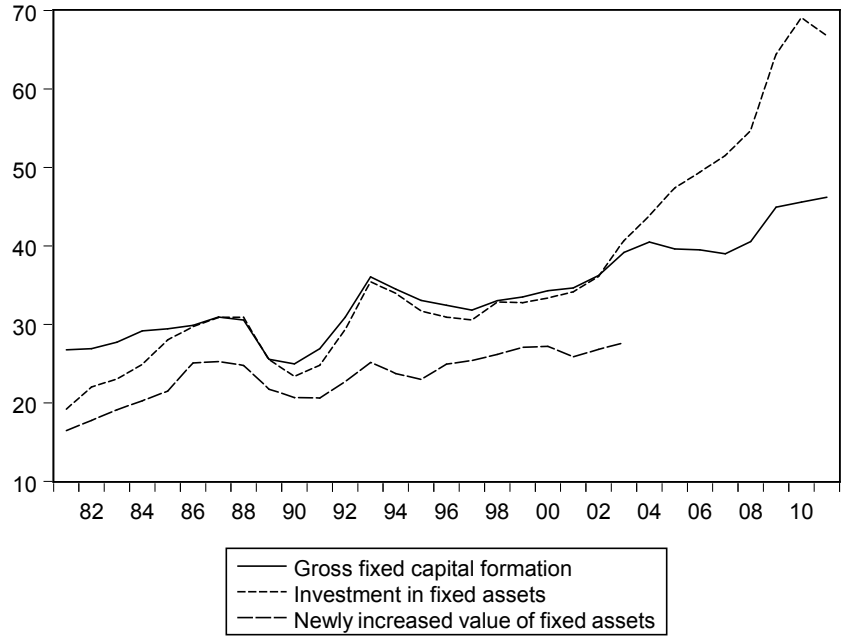


Figure 6.11 – Investment as share of GDP by various methods of calculation

Source: NBS, own calculation

is taken as a reasonable indicator of capital investment, the following conclusion may be drawn: investment as a proportion of total output exhibits a clear rising trend, starting from 27 percent of GDP in 1981 and reaching a maximum of 46 percent of GDP in 2011. This rise has been fairly steady, with the exception of a sharp drop in the late 1980s when GFCF was at its lowest proportion of GDP at 25 percent. A peak was reached in 1993, during the period of very high inflation, after which there was a decline for around four years before the share began to increase once more. Thus, regardless of any questions regarding the reliability of the data it seems clear that China's growth has taken place over a period in which investment has taken an ever more dominant role in the generation of economic activity.

In order to analyse the levels of investment undertaken by the different classifications of firms, we utilise both the "investment in fixed assets" series which gives a breakdown of by ownership type of firm, and "gross fixed capital forma-

tion" from the flow-of-funds accounts. The former can be used to obtain an estimate of the proportion of total shares in investment expenditure from each type of firm. The latter can be used to form an estimate of the total share of investment spending in output undertaken by the firms sector as a whole.

Shares in investment expenditure from the "investment in fixed assets" series are shown in Table 6.14. These figures suggest a strong shift in investment expenditure from the state-owned sector to the private sector. The private sector share of total investment expenditure increases from around one third of total investment expenditure in 1995, to almost two thirds in 2010.

	Private	Foreign	SOU
1995	34.43	11.13	54.44
1996	35.77	11.83	52.40
1997	35.91	11.60	52.49
1998	35.43	10.47	54.11
1999	37.70	8.88	53.42
2000	41.94	7.92	50.14
2001	44.63	8.06	47.31
2002	48.67	7.93	43.40
2003	52.18	8.83	38.98
2004	54.60	9.89	35.51
2005	57.09	9.49	33.42
2006	60.16	9.87	29.97
2007	62.09	9.72	28.19
2008	62.90	8.91	28.18
2009	62.07	6.90	31.03
2010	63.86	6.19	29.96

Table 6.14 – Investment in fixed assets by ownership classification, percent of total

Source: NBS, own calculation

Table 6.15 uses the flow-of-funds data to produce estimates of the share of investment expenditure in total GDP accounted for by each of the institutional sectors included in the accounts. The figures for GFCF in this table are thus the same as those used to generate Figures 6.1 and 6.8a. In the current table, these figures are broken down further, to show the distinction between gross fixed capital formation (GFCF) and gross capital formation (GCF). The difference between these two categories is accounted for by accumulation or depletion of inventories—investment in working capital. The difference between the two measures is significant in some years: over 5 percent between 1992 and 1995. The table also

	Firms		Govt	Hh.	Total		
Year	GFCF	GCF	GCF	GCF	GFCF	GCF	Cons.
1992	23.48	28.32	2.17	5.82	31.62	37.46	63.90
1993	28.76	34.61	2.62	6.06	37.67	44.48	61.98
1994	27.36	32.50	2.74	5.52	35.92	42.20	60.67
1995	25.72	32.20	2.57	5.77	34.35	41.90	60.45
1996	25.01	29.76	2.56	5.97	33.79	40.44	61.70
1997	23.77	27.23	2.88	5.99	32.88	37.95	60.96
1998	23.96	26.04	3.11	6.57	33.85	37.10	61.12
1999	23.81	25.65	3.01	7.06	34.04	36.74	62.04
2000	23.44	24.25	3.01	7.55	34.11	35.12	62.00
2001	22.97	25.29	3.09	8.22	34.43	36.27	60.99
2002	24.24	25.48	3.34	8.53	36.26	37.87	56.51
2003	25.01	26.78	4.61	9.71	39.38	41.20	57.02
2004	27.29	29.57	5.15	8.23	40.73	43.26	54.44
2005	27.68	29.31	5.18	9.29	42.19	44.02	53.39
2006	29.91	31.71	5.06	7.53	42.54	44.55	52.19
2007	29.15	31.06	4.52	7.26	40.98	43.11	50.05
2008	28.11	30.46	4.69	7.93	40.79	44.05	48.51

Table 6.15 – GFCF and GCF by sector, percent of GDP

Source: NBS, own calculation

includes final consumption as a share of GDP. It is interesting to note that GCF has exceeded 44 percent in three years—1993, 2005 and 2008—but the share of consumption in GDP has been successively lower in each of these three years, falling from 64 percent in 1993 to 49 percent in 2008, a drop of 15 percent of GDP

By combining the share of GCF in GDP of the firms sector from Table 6.15 with the share of each sector's investment in the total from Table 6.14, an estimate may be obtained of the volume of investment undertaken by firms of each ownership type. The results are shown in Figure 6.12.

Notwithstanding the potential data issues already outlined, this estimation presents some interesting results. Firstly, although the proportion of total investment undertaken by foreign-invested firms appears to be falling according to Table 6.14, once the rising share of GDP accounted for by investment is taken into account, the estimated share in GDP of fixed asset investment by foreign-invested firms recovers to its 1995 level of around 4 percent. The estimated share in GDP of private firms' fixed asset investment more than doubles over the period to around 25 percent of GDP, while the share taken by the investment of state-owned units

declines steadily to around 12 percent. The rising share of total investment in GDP is thus accounted for by the private sector—while the share of investment in GDP of the SOE sector drops by around five percent, this is more than offset by the increase in the private sector of around 14 percent.

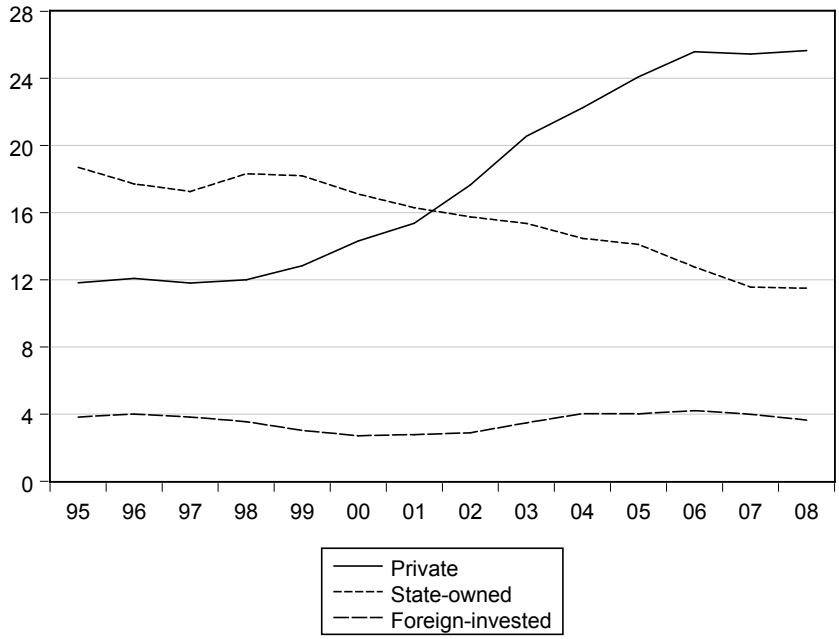


Figure 6.12 – Estimated investment in fixed assets by ownership classification, percent of GDP

NBS, various years, and own calculation

6.5.2 Profits

The question of the profitability of Chinese firms has been the source of some controversy. In 2005 and 2006, a series of papers were published by World Bank authors which argued that "the consensus set of factors... largely centred on households—cannot fully explain China's high *national* saving ratio" (Kuijs, 2005, p. 4). These authors noted the high level of saving in the firm and government sectors but, reliant as they were on the concept of total factor productivity and the Cobb-Douglas aggregate production function, they were unable to offer any

coherent theoretical explanation for these observations.

However, their claim that "the increase in enterprise saving in the last 10 years is associated with a steady rise in profits and profitability of enterprises" (Kuijs, 2006, p. 9) sparked a heated debate in the pages of the *Far Eastern Economic Review*. An article entitled "The World Bank's China Delusions" (Shan, 2006) argued that the World Bank findings were impossible to square with "well-known truths about the Chinese economy"such as the high proportion of non-performing loans on the books of the state-owned banking system.

Shan took issue with the World Bank authors' findings that the return on equity had risen substantially over the decade to 2005, because their figures did not include taxes on production which, as already established, are very high—over 30 percent according to Shan.

Shan claimed further that gross profit margins for Chinese firms—the difference between revenues and costs as a share of revenues—has been falling consistently due to rising costs of raw materials.

The World Bank authors responded (Hofman & Kuijs, 2006) by arguing that the gross profit margin calculated by Shan included only a subset of the total costs of production, and produced calculations that showed that margins, although much lower than those calculated by Shan, had in fact risen substantially over the period under consideration.

Further, they argued, by focusing on profit margins alone, Shan had failed to grasp the significance of increases in turnover:

> Mr. Shan neglects the effect that rapid turnover growth has on profits. *By definition*, total profits equal profit margin on sales times sales volume, and rapid economic growth boosted sales volumes in recent years." (Hofman & Kuijs, 2006, emphasis in original).

However, this claim is misleading because it fails to distinguish between increased sales revenues from higher growth at constant levels of capacity utilisation, and shifts in capacity utilisation, as emphasised by Steindl (1979).

In a *closed* growing economy, the distribution of saving between households and firms is determined by the saving propensities of each sector, and the distribution of income between the two sectors. The very low level of dividend payments by Chinese firms implies that the "saving propensity of capitalists" in China is effectively one hundred percent. The distribution of total saving is thus determined by the household saving propensity and the distribution of income.

In Steindl's analysis, the distribution of income shifts towards profits at higher rates of capacity utilisation due to the existence of overhead labour costs. However, higher growth rates at constant capacity utilisation will have no effect on the relative shares of saving in output. Thus, the rising *share* of saving in the enterprise sector cannot be directly connected to increased sales revenues without further assumptions about profit margins.

This is not the case however in an economy with a rising trade surplus—the increased sales revenue may accrue as the enterprise sector increases its relative market share globally, without changes to the internal distribution of income or saving propensities. Further, the data used by the authors in this debate all use data from the "industrial enterprise survey". Shifts in the relative shares of agriculture, industry and services in the structure of the economy may therefore affect the results.

Part of the confusion surrounding this debate relates to the uncritical use of accounting measures which are designed to describe the characteristics of publicly-traded, privately-owned companies. Applying such concepts are "the return on owners equity" to the state-owned sector of the Chinese economy leads to faulty conclusions.

In the following sections, the evidence is reviewed and updated in an attempt to clarify some of the main points of contention, and provide the groundwork for a coherent analysis of the dynamics of accumulation.

Profit margins

One way to obtain an estimate of the share of firms' revenue that accrues as profits is to use the flow-of-funds data. As with estimating income shares (Section 6.4.4), a decision must be made on the proportion of total tax revenues that should be deducted from the income of the firm sector before calculating the remaining share of income as profit. Because the flow-of-funds works on the basis of net value-added, the intermediate costs of all firms are netted out of the figures. Thus, once tax, interest and dividend payments are subtracted from income, all that remains is wage costs. The only indicators that may be obtained from the flow-of funds are thus the shares of these categories in the total value-added accruing to the firm's sector.

Three such measures are shown in Figure 6.13. The first shows the ratio of value added less wage costs to value added in the firm sector. The other two indi-

cators additionally subtract interest and dividend payments and taxes on production (Primary income/value added) and net income tax and transfer payments (Disposable income/value added).

All three indicators show an upward trend, although this is less pronounced in the case of the pure wage-cost indicator. The gap between the pure wage-cost indicator and that which includes production taxes and property income is very large, reflecting the high rate of corporation tax.

What these indicators suggest is that the wage share in income has fallen over the period, from 1992 when just under 45 percent of total value-added was spent on wages, to 2008 when the figure was just over 35 percent. Other costs, in the form of interest payments and taxes, together added up to a level almost equal to that of wage costs at the start of the period. These costs fell faster than wage costs so that by the end of the period they constituted a smaller share of the total.

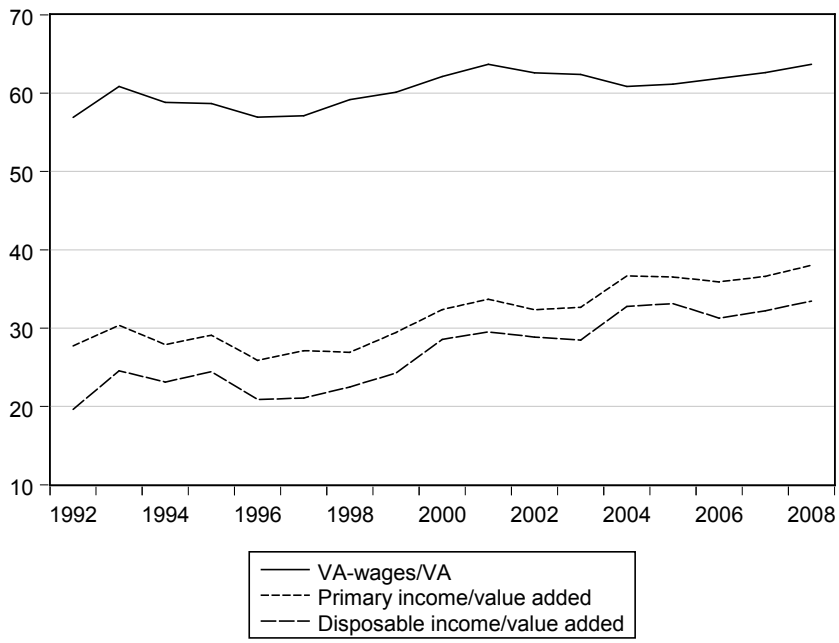


Figure 6.13 – Measures of profit margin calculated from flow-of-funds

Source: NBS, own calculation

According to these indicators, profit margins have risen in the enterprise sec-

tor as a whole. However, since the flow-of-funds data in China does not provide any breakdown of indicators by firm ownership, it is not possible to get beyond the aggregate enterprise sector to consider the profitability of firms of different ownership types.

The remaining analysis in this section therefore relies on enterprise survey data. Detailed enterprise survey data is obtained annually by the Chinese authorities. All firms above a certain size are required to submit survey data.[18] A number of authors have gained access to either all or part of this data, but this was not possible for the current study. Instead, the summaries of the survey data that are published annually in the *Statistical Yearbook*s are used.

The survey data is not directly comparable with the official GDP and flow-of-funds figures since only a subset of industrial firms are included in the sample. Furthermore, the criteria for inclusion in the sample have changed over time, meaning that care must be taken when extrapolating from the enterprise survey to the firms sector as a whole.

The enterprise survey summary data contains figures, disaggregated by ownership type on the total number of firms included the survey, total gross industrial output value, and a number of indicators including costs, final profits, fixed assets, and liabilities.

Using these data, two measures of the profit margin are shown in Table 6.16. The first, "gross profit margin" is obtained from the two series, "Cost of principle business" and "Revenue of principle business", by finding the difference between revenues and costs as a share of revenues. The second, "net profit margin" uses the series "Total profits" taken as a share of revenues.

These profit margins, calculated for all firms firms in the sample, closely match the series used by Kuijs and Shan in their dispute over the profitability of Chinese firms. However disaggregating over the three main ownership types and calculating profit margins for each reveals more than can be discerned from the aggregate figures alone. While the "gross margin" does indeed fall for all firms overall up until 2006, this is only the case for private and foreign-owned firms. The overall figure captures the combined effects of the profit margin in each sector, along with the changing relative shares of each firm type in the sample. These shares are shown in Table 6.17, The share of output of private firms in the sample

[18]Firms in the survey include state-owned enterprises and private firms "with annual revenue from principal business over 5 million yuan." (National Bureau of Statistics, China, 2011, Table 14-1)

	Gross Margin				Net Margin			
	All	SOE	Priv.	For.	All	SOE	Priv.	For.
1998	17.7	19.3	15.3	16.5	2.3	1.6	3.6	2.7
1999	17.9	19.6	14.9	17.5	3.3	2.8	4.2	4.2
2000	18.4	20.7	14.0	17.6	5.2	5.7	4.0	5.7
2001	17.6	20.1	13.0	16.7	5.1	5.4	3.9	5.5
2002	17.6	20.5	12.8	16.9	5.3	5.5	4.1	6.0
2003	17.1	20.7	12.9	16.1	5.8	6.6	4.4	6.4
2004	15.9	19.9	12.0	14.5	6.0	7.6	4.3	6.0
2005	15.6	19.0	12.9	13.6	6.0	7.6	4.6	5.3
2006	15.6	19.2	13.1	14.2	6.2	8.4	4.9	5.4
2007	16.3	19.7	14.3	14.8	6.8	8.8	5.6	6.0
2008	15.3	17.0	14.7	14.1	6.1	6.1	6.3	5.6
2009	15.7	17.9	14.2	15.3	6.3	6.1	6.2	6.7
2010	16.1	18.3	14.8	15.6	7.6	7.6	7.3	8.0

Table 6.16 – Profit margin by type of ownership.

Source: NBS, various year, own calculation

rises from only 3 percent to almost a third, while the share of the SOE sector drops from around half to just over a quarter.[19].

Turning now to the "Net profit margin", a different story emerges. Although at the start of the period the profit margin in the private sector is the highest of the three, two years later it has been overtaken by both the SOE and foreign sectors. Margins continue to rise in all three sectors until 2007 when the SOE profit margin peaks at 8.8 percent. In 2008 and 2009—the years in which the effects of the financial crisis were most strongly felt—the SOE net profit margin fell to 6.1 percent. The profit margin of the foreign-invested sector also fell in 2008. Margins rose again in all three sectors in 2010 by which point the margin reached between 7 percent and 8 percent in all three sectors.

If this net profit margin is a reliable indicator, it appears to contradict much of

[19]The figures do not sum to 100 percent because there are a number of other firm ownership classifications included in the sample that are not shown in the table. Further, the figures on total output value need to be treated with some care. The explanatory notes admit that double-counting of output is hard to avoid: "Gross industrial output value is calculated following the principle of factory approach, i.e. industrial enterprise is used as the basic accounting unit in calculating the gross industrial output value. By this approach, value of the same product is not to be double-counted, and the output value of different workshops (branch factories) within the enterprise should not be added. However, this approach allows the possibility of double counting between enterprises." (National Bureau of Statistics, China, 2011, Chapter 14, Explanatory note on main statistical indicators). For this reason, indicators calculated using the gross output values should be treated with some caution.

	SOE	Private	Foreign
1998	49.6	3.1	24.7
1999	48.9	4.5	26.1
2000	47.3	6.1	27.4
2001	44.4	9.2	28.5
2002	40.8	11.7	29.3
2003	37.5	14.7	31.2
2004	34.8	17.4	32.7
2005	33.3	19.0	31.7
2006	31.2	21.2	31.6
2007	29.5	23.2	31.5
2008	28.4	26.9	29.5
2009	26.7	29.6	27.8
2010	26.6	30.5	27.2

Table 6.17 – Output of by ownership type, percent of total output of firms in survey

Source: NBS, own calculation

the current consensus that regards the state-owned sector as inefficient and unprofitable. What cannot be determined from these figures is the degree to which rising profit margins are the result of monopolisation, and to what extent they are due to increasing efficiency of production.

These figures also suggest that the SOE sector was affected more than the other sectors by the global financial crisis. The fall in the net profit margin in 2008 and 2009 was the result of an absolute fall in profits in these two years in the SOE sector. This is the only such occurrence across all of the sectors—apart from these two years, absolute profits rose every year in all sectors

Profit rates

The analysis in this section has so far examined the share of investment undertaken by each type of firm, relative profit margins and shares of gross output. What remains is to consider the *rate* of profit—the ratio the volume of profit to the size of the capital stock. The enterprise survey provides a number of measures of the volumes of assets held by firms. Series are provided both for "Total assets", which includes working capital and other assets as well as fixed capital, and "Original value of fixed assets". Two indicators of the rate of profit are calculated here using these series. These are found by dividing the final profit figure used above to calculate the "net profit margin" by each of these measures of the

	Profit/fixed assets			Profit/total assets		
	SOE	Priv.	For.	SOE	Priv.	For.
1998	2.2	9.9	3.7	0.7	4.5	2.0
1999	3.2	11.8	5.9	1.2	5.3	3.3
2000	5.6	11.5	9.0	2.9	4.9	5.0
2001	5.5	11.4	8.6	2.7	5.3	5.1
2002	6.2	12.4	10.0	3.0	5.6	6.0
2003	7.9	13.8	12.7	4.1	5.9	7.1
2004	9.5	14.3	13.2	5.0	6.0	7.0
2005	10.3	16.3	12.1	5.5	7.0	6.4
2006	11.6	18.4	13.2	6.3	7.9	7.0
2007	13.7	22.6	15.2	6.8	9.5	7.8
2008	12.5	24.1	13.6	4.8	10.9	7.3
2009	12.4	22.8	15.4	4.3	10.6	8.1
2010	15.8	26.7	19.4	5.9	12.9	10.0

Table 6.18 – Profit to net fixed assets ratio

Source: NBS, own calculation

assets held by firms. The calculated rates of profits are shown in Table 6.18.

Since these figures are calculated using the same profit figures as the net profit margin figures in Table 6.16, they follow the same trend over time—rising steadily in all three sectors with the exception of the SOE sector in the two years that followed the Lehman's crisis. However, the relative positions of each sector are reversed: the calculated profit rates are highest in the private sector and lowest in the SOE sector. This is to be expected since the SOE sector is concentrated in capital-intensive industry. What cannot be determined from these figures is the extent to which this is a legacy of the past—such that the SOE sector is "burdened" with a large obsolete capital stock which pushes down calculated profit rates—or whether the rate of return on *new* capital investment is also significantly higher in the private sector.

6.6 Conclusion

This chapter has presented a detailed analysis of the physical flow transactions that combine to generate China's rapid growth of output, saving and investment. This analysis is organised around the official flow-of-funds accounts but has also utilised a range of other data sources. In using these alternative data sources in conjunction with the flow-of-funds accounts, the conditions of stock-flow consis-

tency are kept constantly in mind—since all series are part of a stock-flow taxonomy, changes in any individual series imply that accomodating changes must take place elsewhere in the macroeconomic structure.

The findings of this analysis are now summarised, before the financial counterparts to these flows are examined in the following chapter.

Firstly, over the longer time-horizon of the transition from planning, investment has risen steadily as a share of output from under 30 percent in 1980 to close to 45 percent in 2010. More recently, two distinct phases have occured. Both output and investment growth fell during most of the 1990s due to the implementation of austerity measures. These measures were a response to excessive spending—particularly by local governments, due to "soft budget constraints"—which resulted in consistent breaches of the Credit Plan and two major outbreaks of inflation.

Up until the late 1990s, the external position was close to balance, although the flow-of-funds accounts report domestic investment as higher than saving for the first half of the 1990s. Until around the turn of the century, growth was therefore less skewed towards investment expenditure that in more recent years: output growth was above 10 percent in the first half of the 1990s while investment growth was below 10 percent, leading to a falling share of investment in output over the 1990s.

The most recent boom cycle began around the turn of the century. Output growth increased steadily over this period until the outbreak of the global financial crisis in 2007–08. Investment as a share of output rose sharply over the first half of the decade, due to a strong emphasis on fixed capital investment, before levelling out at around 40 percent of GDP in the middle of the decade. From this point, expanding export demand continued to drive growth until the onset of the crisis. In response to the crisis a further stimulus was introduced, pushing investment up to almost 45 percent of GDP.

Since saving is by definition equal to the sum of investment and the external surplus, saving has also risen steadily over this period as a share of output. However this saving has been unevenly distributed among the domestic sectors. While saving as a share of total output has risen in all three sectors, it has done so most significantly in the firms sector.

In any given sector, rising saving as a share of total output may come about in two possible ways: either an increase in the proportion of income saved, or an increase in the share of total income of that sector. When rising saving across

sectors is broken down in this way, a different pattern emerges for each sector. Firstly, the government share of income has risen moderately. Government income is primarily derived from taxation of the firms sector, thus government expenditures and saving are essentially deductions from firms' profits. While the government share of income has risen moderately, government saving appears to have risen more quickly, although this trend is likely to have reversed in 2009 due to the fiscal stimulus.

More interesting is the contrast between the household and firms sectors. Since firms distribute almost no dividends, firms "save" all profits. Thus rising firms saving is the result of profits increasing as a share of national income. The counterpart to rising firms profits is falling household income due to a lower wage share. The rising share of household saving in output is thus the result of the "saving propensity" of households rising fast enough to more than offset their falling share of income.

This shift in the distribution of income towards the firms sector has reduced the reliance of firms on credit for the financing of investment. Although investment exceeds after-tax profits in the firms sector, the deficit is narrowing such that a rising proportion of investment is funded through retained earnings.

The distribution of both investment and saving within the firms sector has also shifted considerably over the period from 1998 onwards for which disaggregated data are available. In particular, the share of output, saving and investment by private firms rose, while the SOE sector declined in significance. What the evidence appears to suggest is that profit margins have risen steadily, with that rise distributed fairly uniformly across the firms sector, regardless of ownership type of firms.

Despite relatively uniform profit margins across the firms sector, the share of output and investment accounted for by private firms has risen, while the share accounted for by SOEs has fallen. The foreign sector appears to have maintained a steady share of output but investment expenditures have been decreasing. Finally, rates of profit have risen in all sectors, but these rates are much higher in the non-state sectors—around twice as high.

How are these observations to be explained?

Firstly, the combination of a rising share of profits in national income, widening profit margins and rising rates of profit suggest a significant rise in the Kaleckian monopoly mark-up. This result is at odds with Kalecki's own findings on the relative constancy of the wage share in national income over extended periods of

time. Kalecki concluded that this was due to the fact that the cost of raw materials and the degree of monopoly tended to move in opposite directions, but that this was not a general result which would continue to hold indefinately:

> It is, of course, not at all certain that in the future the rise in the degree of monopoly will continue to be compensated by a fall in the price of "basic raw materials". If it is not, the relative share of manual labour will tend to decline (Kalecki, [1939] 1990, p. 248).

Over the period under consideration, the cost of raw materials has risen. This is why, of the two measures of the profit margin that are calculated, the "gross margin" has fallen while the "net margin" has risen—the net margin includes other costs which have fallen faster than the rise in raw materials.

However, Kalecki is here referring specifically to the case of an economic downturn in which monopoly pricing power increases and the prices of raw materials fall.

> It has recently been argued by Mr Harrod that the degree of monopoly increases in the boom and falls in the slump... Mr Harrod was rightly criticized in that there exist other factors which influence the degree of monopoly in the other direction. For instance, in the slump, cartels are created to save profits... More important still is the fact that, in spite of the fall of prices of raw materials and wages, some prices of finished goods tend to be relatively "sticky" in the slump... it can be concluded that the degree of monopoly tends to increase in the depression and decline in the boom (Kalecki, [1939] 1990, pp. 248–9).

The rise in the mark-up observed in China has, however, taken place—at least from around the turn of the century until the onset of the global financial crisis—during a sustained boom.

This rise in profits also presents conceptual difficulties for marginal analysis based on the neo-classical aggregate production function: if the return to capital and labour are determined by their relative marginal products, the assumption of declining marginal productivity should result in the price of labour rising and the price of capital falling as an investment boom and the "Lewis turning point" coincide. The usual explanation is that labour productivity has risen, but other than being true in the tautological sense that output has risen faster than employment,

this explanation offers little in the way of enlightenment and simply leads to increasingly incoherent discussion about the employment of factor inputs versus shifts in total factor productivity.

A more likely explanation is to be found in the behaviour of the state-owned firms. Although the significance of these firms is diminishing in terms of share output, they still comprise the industrial "core" of the Chinese economy, concentrated in heavy industrial production. In a capitalist market economy, it is these firms that would be most likely to form the types of "cartels" that would lead to monopoly pricing, excess capacity and the slowing of growth.

Such outcomes result from the attempts of firms to set prices and output such that profits are maximised at a point as close to the "monopoly" position as posible, thorugh various price coordination measures between firms operating in ostensibly "competitive" markets (Baran & Sweezy, 1966).

State-owned firms in China are unlikely to operate in this way. Along with control over the banking system, these firms provide the state with its most important levers of control over the economy. The investment decisions of these firms are not be dictated by profit maximisation, but by the political authorities. Finance for investment by these firms is provided by the state-owned banking system. Of particular significance is that it is likely that these firms will not react to excess capacity by scaling back investment expenditures.

These firms therefore perform a quasi-fiscal role in the economic system. Over the period of transition from planning, as direct government economic activity was reduced, these firms substituted for the government in maintaining aggregate demand, despite the resulting losses eventually being placed on the books of the banking system as non-performing loans.

From around the turn of the century, the ability of these firms to generate profits appears to have recovered, while at the same time the share of profits in national income gradually rose. However, the *rates* of profits in the state-owned sector are considerably lower than those in the private sector. This reflects a higher intensity of investment expenditure as a share of revenues in the state sector—as would be expected in the heavy industrial sector—while profits as a share of revenues are approximately equal. The implication of this is that profit income will not be evenly distributed among the firms sector: some share of the investment outlays of state-owned firms will accrue as profits in the private sector.

In an economy such as China where consumption out of profits is close to zero, the profits of firms are determined by investment expenditures less saving

by households and government. Despite rising household saving rates, household saving as a share of total saving is falling, while the opposite the is case in the government sector, but to a lesser degree. An increasing share of the investment outlays of firms thus accumulates as profits within the firms sector, but these profits do not accrue in proportion to the investment outlays of these firms: a portion of the investment expenditure of the state-owned sector returns as the saving of private-owned corporations, rather than profits in the state-owned sector.

If the investment decisions of firms in the private sector are influenced by the rate of return on capital investment, this dynamic will result in a strong inducement toward investment on the part of these firms also: the additional profits that accrue in this sector as a result of the investment outlays of the state-owned sector will serve to raise the rate of profit in the private sector. This in turn will stimulate private-sector investment, resulting in even higher rates of profit.

This result is the symmetric opposite of the case of "monopoly capital" in which those firms operating in the cartelised sector of the economy extract a share of the investment outlays of competitive firms. In the case described by Steindl, this "maldistribution of profits", in conjunction with the high saving of households, leads to excess capacity, further reducing the incentive of firms to invest.

In the analysis presented here, the investment behaviour of the state-owned sector, and in particular the insensitivity of this investment to excess capacity, becomes the key determining factor in generating growth.

While this analysis provides a justification for the high rates of growth of output and investment, the question of the apparent increase in the profit margin is at least partially unresolved. Traditional explanations based on the degree of monopoly mark-up do not seem to fit the observed facts.

This analysis also strongly implies that China's growth has not followed any kind of steady-state "balanced" growth path in which all variables grow in step and at equal rates. Growth has resulted from a series of disequilibrium processes. With the shift to a "capital deepening" path, growth has been maintained by successive rounds of increasing capital intensity, leading to an ever higher share of investment in national income.

Chapter 7

China's flow-of-funds II: financial transactions

7.1 Introduction

Chapter 6 presented a detailed analysis of the evolution of real macroeconomic variables, disaggregated by institutional sector. It was shown that the retained profits of firms account for a high and rising share of national income, driven by the investment expenditure of firms. These retained earnings are heavily taxed by the government which, in combination with the very high level of investment expenditure by firms, results in the firms sector running a financial deficit overall.

The counterpart to this deficit is located in the strongly positive net financial position of households. The surplus of households has also financed a moderate government deficit for most of the period under analysis, although the flow-of-funds data record a shift into surplus for the government sector from around the mid-2000s, contradicting the official government finance figures.

Despite the deficit of the firms sector, the majority of investment is funded out of retained earnings. Using disaggregated data on the firms sector, it was shown that investment and earnings are unevenly distributed across the firms sector. It was argued that this is the result of a quasi-Steindlian process in which the normal outcomes of monopoly are reversed.

The focus of investigation now switches to the financial system. The monetary and financial transactions of each institutional sector—and the inter-sectoral flows that those transactions generate—are examined in detail. By analysing the financial flows that are the counterpart to the system of sector deficits and sur-

pluses, the flow-of-funds analysis of the previous chapter may be "closed".

While the physical flow analysis of the previous chapter constructed an empirical framework in which the circular flow of income is broken down on a sector-by-sector basis, the analysis in the current chapter examines the role of the financial system in bridging between those sectors in which incomes and expenditures are unequal.

The primary purpose of the chapter is to demonstrate that the expansion of credit and money in China have been the result of an endogenous credit-investment process, driven by the investment dynamics analysed in the previous chapter. This contrasts with the widely held view that China's monetary policy operates through control of the monetary base, and that this control is complicated by the requirements of sterilising the expansion of reserves resulting from the current account surplus.

Instead, it is demonstrated that reserves have been freely available over the period for which data are available, as shown by the large volume of excess reserves in the banking system and the liquid inter-bank market. Over the recent period of current account surpluses, the level of excess reserves has been successively reduced through balance sheet operations on the part of the PBC, although not to a point that would significantly constraint the lending ability of banks. Control of credit growth has instead primarily taken place through administrative influence of state-owned enterprises and the banking system.

Since the official flow-of-funds accounts do not provide separate entries for the monetary authority and banking system, the analysis of the interaction between the banking system and the central bank is achieved through generating a set of augmented flow-of-funds accounts using monthly balance sheet data from the PBC.

7.2 Sector financing

The analysis in this chapter will start from the point of intersection between the physical and financial flow-of-funds accounts: the net financial balances of the system.[1] The real income and expenditure flows that combine to generate these financial balances were analysed in the previous chapter. Stock-flow accounting

[1] As was noted in Section 6.3.1, there is some divergence between the net financial position figure reported in the physical transactions table and that reported in the financial transactions table (see Figure 6.10).

enforces the constraint that, for each sector, these net financial positions must equal the total net change in the holdings of financial assets and liabilities.

The deficit position of the firm sector can only be accommodated so long as other sectors are willing to increase their holdings of the financial liabilities issued by the firms sector. At the same time the saving of the household sector sets up a demand for financial assets. The predominantly bank-based nature of the Chinese financial system means that the majority of the financial flows that result from this pattern of accumulation take place through the banking system.

This of course does not imply that it is the decision to save by households that leads to the expansion of deposits and therefore lending to firms, investment and growth: the opposite is the case. By accepting the liabilities of firms and granting them access to new deposits, the banking system accommodates the liquidity required for new investment projects, which in turn generates additional income from which households saving takes place, in form of bank deposits.

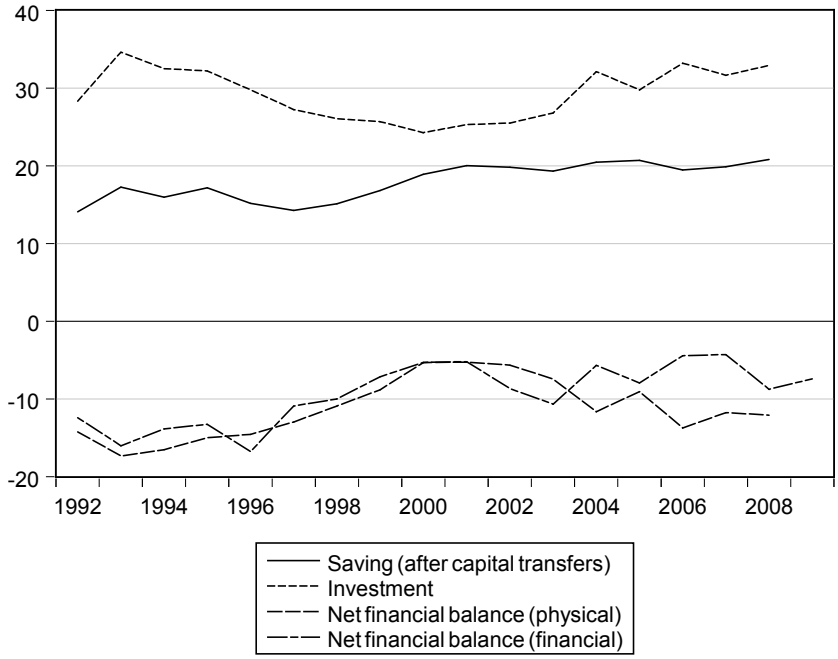
7.2.1 Firms

Figure 7.1 summarises the way that the firm sector as a whole has financed its deficit. Figure 7.1a shows the saving and investment of the firm sector (as positive values), and the resulting net financial balance. Figure 7.1b shows the magnitudes of the financial flows resulting from transactions in the various financial assets and liabilities used by firms.

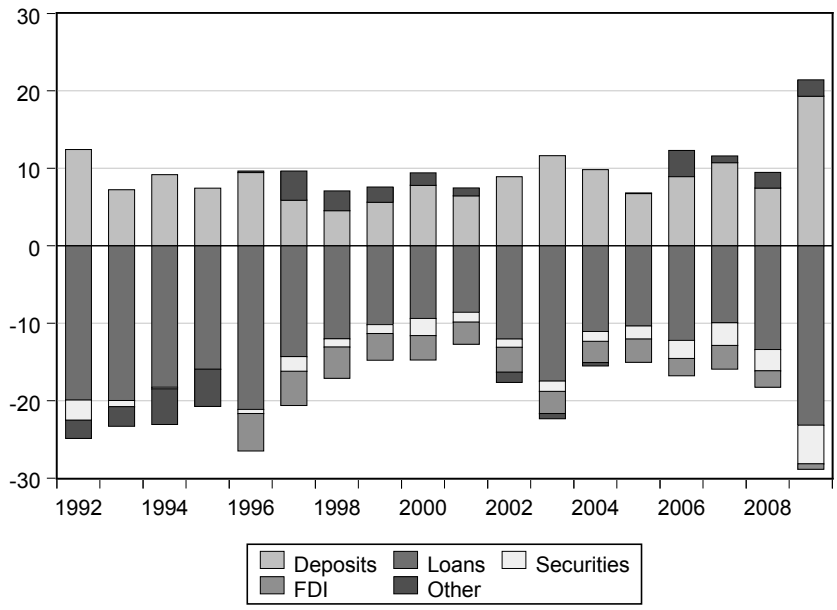
As would be expected, bank loans are the largest item in the borrowing of firms. In addition to borrowing from banks, increases in firms' liabilities also includes the issuance of securities and FDI inflows. The relative weight of FDI has fallen over the period of analysis, while the issuance of securities varies over the 1990s and then rises steadily during the 2000s.

The additional category, "other", is primarily composed of three items from the flow-of-funds accounts: "changes in other foreign assets and debts", "errors and omissions in the balance of payments", "and "miscellaneous". This category may therefore contain a significant element of international capital flows. It is interesting to note that this category appears to switch from being a net source of funds until 1995, to subsequently become a net use of funds, with the exception of two years. This may be evidence of the accumulation of foreign assets in the firms sector.[2]

[2]Since 2001, export companies with revenues over a certain threshold have been allowed to



(a) Saving, investment and net financial balance



(b) Annual change in financial assets and liabilities

Figure 7.1 – Firms' financial transactions and net balance, percent of GDP

Source: PBC, NBS and own calculation

The most interesting feature of this summary of the financial operations of the firms sector is the volume of deposits accumulating in the firms' sector. The holding of liquid balances has always posed problems for marginalist economics. As noted in Section 2.2, the New Keynesian model—widely regarded as the pinnacle of achievement in monetary theory—simply assumes the holding of money balances by households. Without such an assumption, no baseline rate of interest exists in the model and monetary policy loses all power, even in the presence of nominal rigidities.

Authors in the Post Keynesian tradition have taken a more coherent approach to such matters, emphasising the roles of uncertainty and liquidity preference in the holding of money balances. However, this analysis has primarily concentrated on households and—to a lesser extent—the banking system (eg. Chick & Dow, 2002).

A thorough theoretical treatment of the holding of liquid financial assets by the firms sector is to be found in Toporowski's work on "overcapitalisation" (2008a). Section 3.4 examined the effects of overcapitalisation on the sectoral balances of a stock-flow consistent framework. This analysis was developed further through the incorporation of the holding of deposits by firms into the growth model developed in Section 4.6.3.

The accounts shown in Figure 7.1b clearly demonstrate the empirical relevance of this analysis. The volume of issuance of financial liabilities by firms greatly exceeds the borrowing requirements implied by the net financial balance of the sector, with the excess of borrowing over investment expenditure diverted mostly towards the accumulation of liquid balances.

What is impossible to discern at this level of aggregation is how deposits and loans are distributed within the firms sector. Two possible extreme cases can be imagined: firstly, the case in which every firm in the sector corresponds exactly to the "representative" firm given by the aggregate statistics. In such a situation, the increasing loan liabilities of each firm would be partially hedged by increasing holdings of bank deposits, with the remaining loan liabilities accounted for by capital investment. The opposite extreme case of "maldistribution of profits" would occur when all investment was undertaken by "marginal" competitive firms using bank credit, but the structure of the economy were such that all profits

hold foreign currency bank deposits. The amount of foreign exchange that is allowed to be held is calculated as a percentage of total export earnings, with the initial threshold of 20% raised to 30–50% in March 2004 and then raised again to 50-80% in August 2005 (Nagai & Wang, 2007).

accrued to a "cartelised" sector with high mark-ups and low capacity utilisation (Steindl, 1952).

The reality will of course lie somewhere between these to extremes, and without further evidence, at this stage no hypothesis can be advanced as to which more correctly characterises the firms' sector in China. However, the evidence examined so far appears to closely conform to that which would be expected from Kalecki's analysis of the relationship between credit-financed investment, profits and the bank deposits of firms:

> It should be emphasised that the equality between savings and investment plus export surplus plus budget deficit in the general case—or investment alone in the special case—will be valid under all circumstances... If investment increases by a certain amount, savings out of profits are *pro tanto* higher.
>
> To put it in a more concrete fashion: if some capitalists increase their investment by using for this purpose their liquid reserves, the profits of other capitalists will rise *pro tanto*, and thus the liquid reserves invested will pass into the possession of the latter. If additional investment is financed by bank credit, the spending of the amounts in question cause equal amounts of saved profits to accumulate as bank deposits. The investing capitalists will thus find it possible to float bonds to the same extent, and thus to repay the bank credits. (Kalecki, [1954] 1990, p. 244)

Kalecki's final point rests on the assumption that the additional saving which accumulates in the form of bank deposits as a result of newly increased credit-financed investment will subsequently be used to purchase securities issued by those firms which undertook the investment expenditures. These firms will thus be able to substitute short-term bank financing for long-term funding in the capital markets. The distinction between financing and funding is emphasised by Davidson:

> [T]he role of the banking system... is to create additional short-term finance whenever entrepreneurs wish to increase the flow of real investment. This bank-created (non-resource using) finance must be distinguished from the role of long-term financial markets which require the public to give up an amount of liquidity equal to real savings (i.e.,

> unexercised income claims on resources) in the process of funding the investment. (Davidson, 1986, p. 101)

This replacement of bank financing with long-term funding through the issuance of securities does not appear to be taking place in China—partly as a result of the underdeveloped state of the capital markets. What the analysis shows instead is that firms, in the aggregate, are able to finance the majority of their investment expenditures through retained earnings. Given the level of export earnings and FDI in the economy as a whole, those expenditures that do require financing by additional bank lending are falling in comparison to the volume of additional bank deposits generated by that investment spending. This is more clearly visible in Figure 7.2 which isolates the annual change in firms' deposits and loans. Advanced econometric analysis techniques are not required to establish the correlation between these two series.[3]

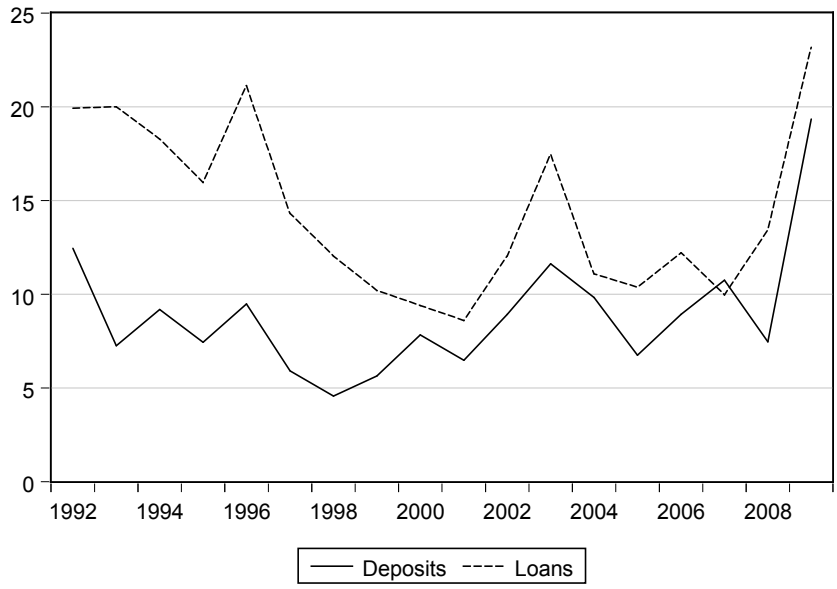


Figure 7.2 – Loans and deposits of firms sector, stocks, percent of GDP

Source: PBC, NBS, own calculation

[3]It is also interesting to note that the volume of investment expenditure by the firms sector was exactly equal to 20 percent of GDP in both 1992 and 1993. A sceptic might be tempted to suggest that the statistical authorities started from the GDP figures and worked their way back to bank lending.

The gap between the yearly increase in loans to firms, and the equivalent increase in the accumulation of deposits in the sector has fallen sharply, such that in 2007 the volume of bank deposits accumulated by firms was greater than the increase in bank lending to the sector. In recent years, the firms sector as a whole has been able to raise enough funding from non-bank sources to completely offset the "enforced indebtedness" that arises from that portion of household saving which is not absorbed by the trade surplus and government deficit. As a result, the evolution of loans and deposits in the firm sector are close to those that would be observed in the hypothetical case of zero household spending and balanced external and government sectors.

What this analysis also highlights is that it makes little sense to talk about "sources of funding for investment" at the level of the aggregate firm sector. Such measures make sense in the case of an individual firm—a businessman can confidently tell you what proportion of recent capital investment was financed from liquid reserves, and how much from increased gearing—but at the aggregate level, the usual problems of moving from micro to macro analysis become apparent. In the hypothetical case of a closed system without household saving, all firms may exclusively use bank loans to finance investment expenditure. Assuming a uniform distribution of profits, each individual firm owner will be pleased to discover that current-period profits exactly cover investment outlays, and bank debt can be repaid. When asked how investment was financed, this businessman may well reply that bank lending was used. In fact this investment exactly funded itself.

This issue may be illustrated with reference to Figure 7.1. In 2004, total investment expenditures amounted to around 30 percent of GDP. The net financial deficit of the firms' sector was around ten percent of GDP. Firms as a whole were thus able to finance around two-thirds of total investment out of retained earnings. Bank lending was equal to the deficit of the firms sector at around ten percent of GDP. It would be reasonable to say that firms financed one third of investment from bank loans and two thirds from retained earnings. However, this overlooks the fact that firms also raised funds equal to around another five percent of GDP through from FDI and the issuance of securities. Firms also deposited funds equivalent to around ten percent of GDP with the banking system. Without further information, it would be just as correct to net bank loans and deposits down to zero and account for investment spending through FDI, capital market funding and retained earnings.

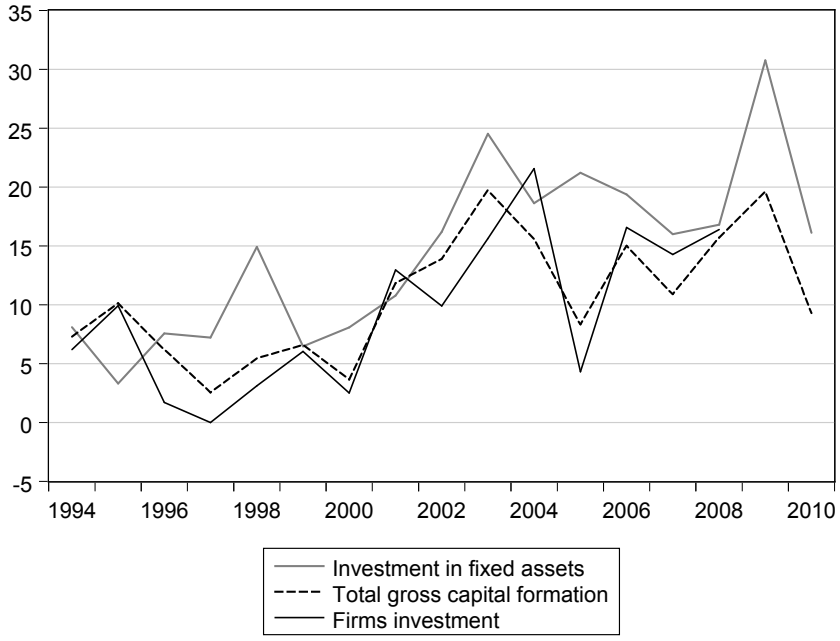
Finally, what Figure 7.2 clearly illustrates is the remarkable increase in bank lending in 2009 which accompanied the stimulus measures introduced by the Chinese government in response to weak export demand: bank lending to enterprises jumped from 13.4 percent of GDP in 2008 to 23.2 percent. The resulting increase in bank deposits was even greater: in 2008 firms placed funds equivalent to 7.5 percent of GDP on deposit with banks. In 2009 the figure was 19.3 percent.

At the time of writing, the equivalent 2009 physical flow-of-funds figures were not available so comparable figures for firms investment expenditures could not be presented. However, a number of indicators may be used to form an estimate of firms investment. Firstly, the total deficit of the firms sector fell in 2009 relative to 2008, according to the financial flow-of-funds tables. This improvement took place despite the large increase in bank borrowing and was primarily accounted for by the even greater rise in bank deposits. Thus, the gap between the saving and investment of the firms sector must have decreased. A plausible hypothesis is that the sharp increase in deposits is the result of a jump in profits due not only to firms' investment expenditures, but also to expenditures by the government which introduced a large fiscal stimulus in 2009.

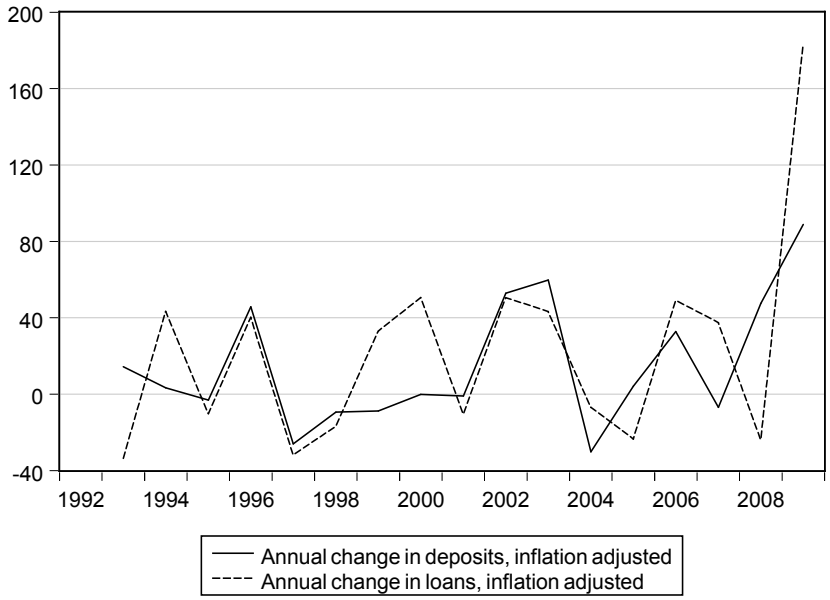
Further evidence can be obtained using the series for investment in fixed assets and gross capital formation that were discussed in Section 6.5.1. As was shown, the investment in fixed assets series appears to have consistently over-reported total investment since around 2003, so these figures should be treated with some caution. The gross capital formation figures are consistent with the flow-of-funds accounts, but do not provide a breakdown of investment expenditure by sector.

Figure 7.3 shows a comparison between the growth rate of investment and changes in the loans and deposits of the firms sector. Figure 7.3a shows the rate of growth of investment as calculated from the two available data series. The investment in fixed assets series records a very large jump in the growth of investment in 2009, but this must be treated with caution since this series has consistently over-reported the volume of investment. The increase in investment growth derived from the gross capital formation series is much more modest, but still shows investment growth in 2009 reaching a value of 20 percent per annum, equal to the previous highest figure in 2003. The figure also includes the rate of growth of investment by firms calculated from the flow-of-funds data, which appears to track total investment quite closely, as would be expected.

Figure 7.3b shows the growth rate of the loans and deposits of the firms sector



(a) Growth of investment, various measures



(b) Growth of deposits and loans of firms, inflation adjusted

Figure 7.3 – Growth in investment; growth in loans and deposits of firms, percent per annum

Source: PBC, NBS, own calculation

over the same period, adjusted for inflation. If the gross capital formation figures are correct, then the growth rates of loans and deposits in 2009 exceed their historical values by a much greater margin than investment. Loan growth was around 90 percent, compared with a previous maximum of around 60 percent in 2003, while deposit growth in 2009 was more than double the previous recorded maximum.

What these figures figures suggest is that only a portion of the increase in bank lending was directed towards investment expenditures. The analysis of firm overcapitalisation and capital market inflation in Section 3.5 showed that, given the Kaleckian assumptions of a closed economy and zero household saving, loan-financed investment and loan-financed speculative activity *within the firms sector* will result in identical flows on the financial side of the flow-of-funds accounts. Since investment spending by firms will be equal to the saving of firms, the net financial balance will be unaffected by the level of investment expenditure. Increases in loans will equal increases in deposits *regardless of the level of investment expenditures*.

Equally, if all additional lending is used for speculative purposes, such as purchases of real estate or merger and acquisitions activity, all such transactions will simply redistribute the deposits of firms within the sector. The evidence thus appears to support the reported anecdotal evidence that much of the monetary stimulus of 2009 has been diverted not to increased investment, but to speculative activity.

The investment in fixed assets data may also be used to estimate the relative weight of different funding sources for investment. These results must be treated with caution however, both because of the unreliability of the investment in fixed assets data, and because of the theoretical problems involved in using the micro-level concept of funding sources to analysis at the macro level.

The investment in fixed assets data are shown in Figure 7.4. Despite the caveats raised above, the results are largely in line with those implied by the flow-of-funds analysis. Sources of funds for investment purposes are dominated by "self-raising fund and others". This category will include retained profits, as well other "non-market" forms of funding, including entrepreneurs own capital.

The significance of the state budget declined from around 30 percent of total funds sources in 1981 to around five percent of the total by the early 1990s and stayed at close to this level thereafter. Bank lending follows an inverse trajectory to that of the state budget—potentially because the financing of state-led

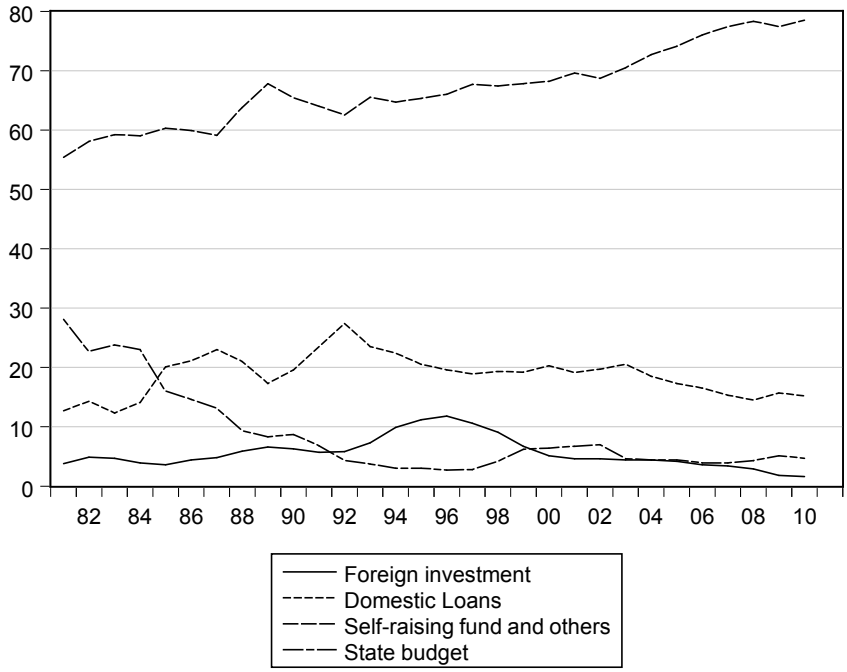


Figure 7.4 – Sources of investment funds, percent of total investment in fixed assets

Source: NBS, own calculation

investment was shifted from the government budget to the balance sheet of the state-owned banks. Bank lending then falls in significance from the early 1990s. FDI financing appears to be relatively insignificant, reaching a maximum of just over 10 percent of total funds in the mid-1990s before declining to very low levels.

Finally, the the financial position of firms may also be analysed using the enterprise survey data. This data-set has the advantage that it is disaggregated by ownership type although, like the investment in fixed assets data, it is not directly comparable with the flow-of-funds and GDP data. These data are used to calculate two indicators on the financial position of the firms sector, shown in Table 7.1.

The first is the liabilities/assets ratio.[4] (Note that the ratio for "all" firms is

[4]NBS notes define liabilities as follows: "Total Liabilities refer to payable liabilities of enterprises that have to be repaid in terms of money, assets or labour services. In terms of payment, it can be divided into liquid liabilities and long-term liabilities." (NBS, 2011, Explanatory notes on main indicators, Chapter 14).

	Liabilities/Assets				Liabilities/Revenues			
	All	SOE	Priv.	For.	All	SOE	Priv.	For.
1998	63.7	47.6	61.2	58.5	108.1	106.2	49.3	80.0
1999	61.8	62.0	59.7	57.7	103.5	138.7	46.8	74.0
2000	60.8	61.0	57.0	57.0	91.2	121.4	46.1	65.0
2001	59.0	59.2	59.8	54.9	85.2	117.1	44.2	59.8
2002	58.7	59.3	59.3	54.4	78.4	110.4	43.4	54.9
2003	59.0	59.2	60.5	55.4	69.5	96.5	44.5	49.9
2004	58.0	56.5	61.2	56.3	62.8	86.8	43.4	48.0
2005	57.8	56.7	59.5	56.7	56.9	77.9	39.4	46.4
2006	57.5	56.2	59.1	56.3	53.4	75.0	36.9	43.9
2007	57.5	56.5	58.4	57.2	50.8	72.9	34.5	44.0
2008	57.7	59.0	56.4	56.0	49.8	75.5	32.6	42.9
2009	57.9	60.3	55.4	56.2	52.7	85.8	32.2	46.5
2010	57.4	60.3	54.8	55.2	48.8	76.9	30.8	43.5

Table 7.1 – Ratio of liabilities to assets and revenues, percent

Source: NBS, own calculation

greater than that of any individual sector in some years. This is because there are additional ownership categories included in the survey for which disaggregated data are not published.) The liabilities/assets ratio for all three sectors is close to 60 percent at the start of the sample, with the exception of the first observation for the SOE sector, which may be due to statistical error. The ratio then fell over the period shown such that the private and foreign-invested sectors held liabilities/assets ratios of around 55 percent by 2010. While the ratio also fell for the SOE sector, this fall was reversed in 2008 and 2009, suggesting that the stimulus lending may have been primarily directed towards the SOE sector.

The liabilities/revenues ratio shows greater variability, both across sectors and over time. This ratio has fallen significantly in all three sectors, although from different levels. This ratio is highest for the SOE sector and lowest for the private sector. It is interesting to note that this indicator jumped sharply for the SOE sector in 2009, the year in which bank lending to firms increased sharply. Although the changing shares of output in the sample over time make it difficult to isolate the effects of individual components of indicators, it appears the the liabilities of the SOE sector increased in 2009 while revenues dropped. In contrast, revenues of the private sector increased while liabilities remained largely unchanged.

The indicators derived from enterprise survey data appear to largely support

the analysis of the flow-of-funds and investment in fixed-assets data—falling values for the derived indicators are to be expected if firms are increasingly using retained earnings as a source of investment finance. However these indicators suggest that the process is not even across the different ownership types: the liability indicators are lower and fall more significantly in the private sector.

At this point, a picture of the changing structure and dynamics of Chinese industry begins to emerge from the statistics. The capital-intensive "core" of the Chinese economy is made up of the SOE sector. While the share of total output and investment expenditure by the SOE sector is falling, this is primarily due to the higher growth rate of the private sector.

This SOE core is made up of the firms that would most readily become "cartelised" in the Baran-Sweezy-Steindl Monopoly Capital analysis (Baran & Sweezy, 1966; Steindl, 1952). The result of this cartelisation of the economy would be cooperation between these large firms in order to set price mark-ups at levels which increased the profits of the cartelised sector at the expense of "marginal" firms, while producing a level of output that resulted in significant excess capacity. This "maldistribution of profits" would result in the investment expenditures of firms in the competitive sector accruing as profits to the "predatory" cartelised sector. The "enforced indebtedness" of the firms sector arising from the saving of households would be skewed towards the competitive marginal firms. The resulting excess of saving over investment expenditure would result in a slowdown in growth and eventually stagnation.

This pattern of accumulation does not appear to characterise the Chinese case. Instead, net profit margins appear to approximately equal across the different firm ownership types and to rise over time. (see Section 6.5.2). At the same time, the *rates* of profits appear to be significantly higher in the private sector. With roughly equal profit margins, higher profit rates can only result from lower rates of investment. Thus, although the share of total investment by private firms is rising, it is likely that investment as a share of output is actually lower in the private sector.

On the liability side, indebtedness appears to be higher in the SOE sector, a finding that fits with the often reported preference of the banking system for lending to the SOE sector. As shown above, the rate of loan growth in the firms sector is almost exactly matched by deposit growth. As demonstrated by Kalecki, loan-financed investment expenditures of firms accrue as profits in the form of bank deposits within the firms sector. However, if growth rate of the credit-financed

investment *per unit of output* is higher in the SOE sector than the private sector while at the same time, the *rate* of profit is higher in the private sector, this implies a reversal of the Steindl-Sweezy mechanism. Instead of increasing concentration of profits in the SOE sector, a share of the revenues generated by credit-financed investment by the SOE sector accrue as profits in the private sector. These profits in turn allow the private sector to finance further investment of its own.

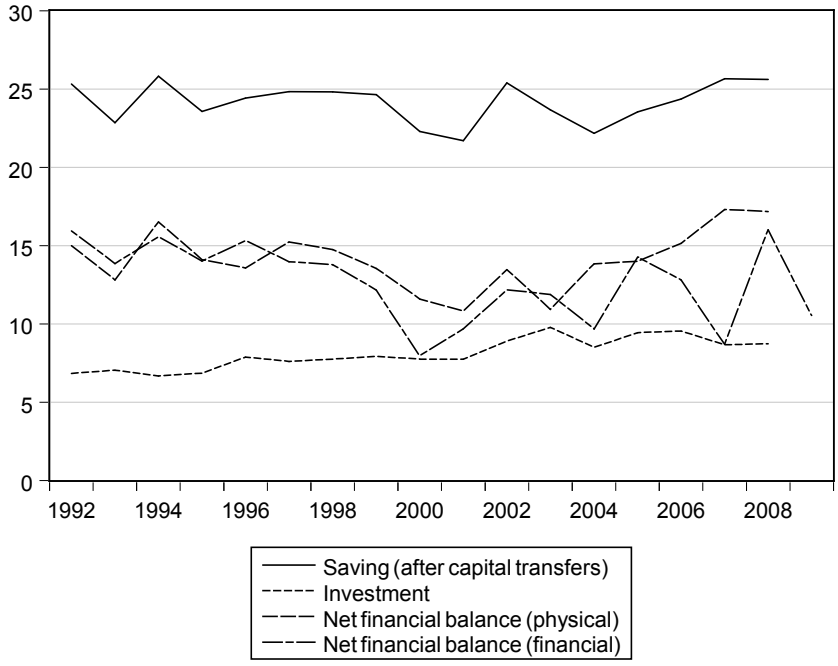
If this is a valid characterisation of the structure of accumulation within the Chinese economy, it implies a fundamentally different role for the SOEs than that held in the conventional view. Rather than causing a drag on growth through inefficiency and monopolisation of credit, the SOEs would be performing a vital role in generating the aggregate demand required to sustain growth. Further, if profits are indeed generated in the private firms sector by the credit-financed spending of SOEs then, rather than starving the private sector of funds by appropriating the majority of credit, SOEs are in fact generating a source of investment funds for the private sector, while assuming responsibility for the resulting liabilities in the form of bank deposits.

The question of how to characterise the structure of accumulation, and in particular the relationship between the SOE and private sectors, is returned to after the analysis of the financial flow-of-funds of the remaining sectors is completed.

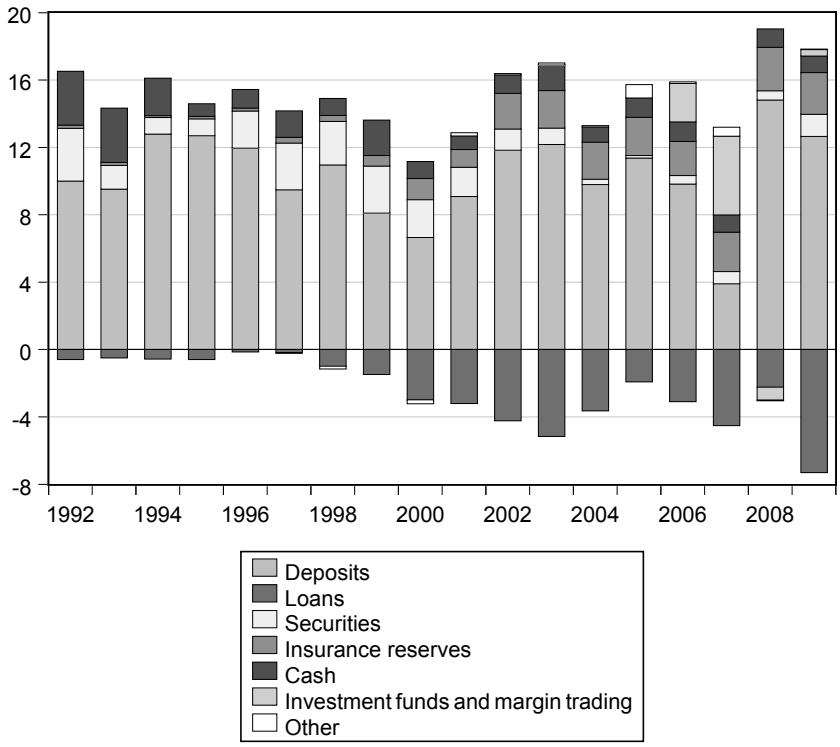
7.2.2 Households

The financial surplus of the household sector and the financial transactions that make up that surplus are shown in Figure 7.5. The divergence between the financial balance calculated from the physical and financial tables is large in several years, most significantly so in 2007, as shown in Figure 7.5a. The balance calculated on the basis of the financial figures tends to report a lower level of net saving by the household sector and also exhibits higher volatility than that computed from the physical tables. Both sets of figures agree, however, that households have maintained a net surplus over the period, and that this surplus has been within the range of around 10-15 percent of GDP in most years.

The financial transaction flows of the household sector are summarised in Figure 7.5b. Until the late 1990s, the household sector engaged almost exclusively in operations on the asset side of its balance sheet: almost no issuance of liabilities took place. This accumulation of assets was composed of bank deposits, cash and securities—mostly government paper. For most of the 1990s then, the



(a) Saving, investment and net financial balance



(b) Annual change in financial assets and liabilities

Figure 7.5 – Households' financial transactions and net financial balance, percent of GDP

Source: NBS, PBC, own calculation

financial behaviour of households was straightforward, at least at the level of formal financial intermediation—households saved their wages and accumulated deposits and the liabilities of the government sector.

It is impossible to determine the relative weight of informal financial operations, however the high proportion of cash holdings in the early years of the sample is in line with the existence of a significant cash-based share of the economic system—both in terms of transactions and credit relationships.

From the late 1990s, the financial operations of households became more sophisticated. Households no longer operated purely on the asset side but also began to issue liabilities in the form of bank loans. From the mid-1990s to the mid-2000s, The volume of households' bank borrowing appears to be correlated with the net financial balance of the sector: rather than being offset by an equal accumulation of assets, the turn to lending of households appears to be accompanied by a dip in the overall balance of the sector, as well as increasing volatility.

On the asset side, cash declines in significance, while insurance reserves increase in significance. This item refers to "net equity of households in life insurance reserves and in pension funds reserves, prepayments of insurance premiums, and reserves for outstanding claims."[5] Two new items were introduced into the accounts in 2006, "Investment funds" and "Deposits with Margin Securities Trading Account". It is likely that the second item is mis-named since margin trading was banned in China until 2010 (Sharif et al., 2011). Therefore these two items probably both to refer to securities trading accounts which require deposits equivalent to the full value of securities purchased.

These two items have been combined into a single category in Figure 7.5. In 2005, the year before these items were first introduced into the accounts, there was a significant volume of net asset purchases under the "Other" item. This item returned close to zero in 2006, suggesting that this was also primarily made up of securities trading accounts. The effect of securities trading on the structure of households asset purchases is remarkable. In 2003, almost the entirety of household saving was directed towards cash, deposits and insurance, with total increases in deposits at around 12 percent of GDP. In 2007, households placed funds equivalent to only four percent of GDP on deposit and over five percent in trading accounts—more if "securities" and "other" are included. In 2008, this pattern reversed: deposits increased by 15 percent while a small volume of funds were withdrawn from trading accounts.

[5]NBS, 2011, Explanatory notes, Chapter 14.

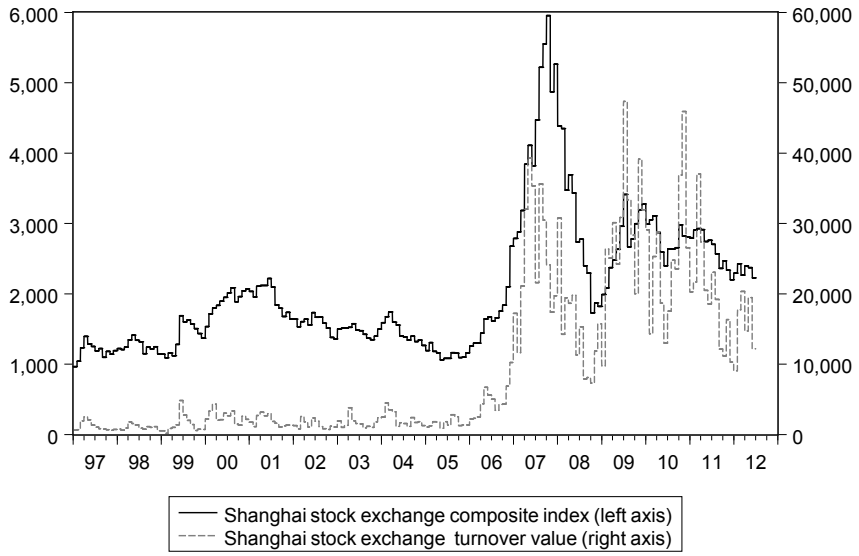


Figure 7.6 – Price index and turnover value of equities traded on Shanghai stock exchange

Source: Datastream

The reason for this pattern of transaction flows is to be found in Figure 7.6, which shows the composite price index of the Shanghai Stock Exchange, along with the turnover value of the shares traded.

In Section 3.5 the theoretical case of capital market inflation taking place as a result of intra-sectoral transactions in a stock-flow system was discussed. The data in this chapter show a clear-cut empirical example of exactly this phenomenon. As shown in Figure 7.1, the issuance of securities by firms is greater in 2007 than in the previous year, but is not out of line with the general trend of increases in funds raised through the capital markets. The level of investment expenditures by firms is no greater than in previous years—it is down slightly on the year before. According to the financial accounts, the net deficit of the firms sector improves moderately due to a slight increase in deposits and a reduction in borrowing.

Overall then, the deficit position of firms *vis-as-vis* the household sector is essentially unchanged, as is the investment behaviour of firms. As will be shown in the following sections, the inflows into trading accounts in financial institu-

tions were more than matched by outflows into purchases of securities—but the majority of these securities were issued by the government, not the firms sector.

As was shown in Section 3.5, secondary market trading will not show up in sector level accounts unless that trading occurs *between* sectors. The stock market inflation of 2007 in China took place primarily through intra-sectoral trading. The flows from households into the trading accounts of the financial system only record the year-on-year change in position. Once funds are deposited with brokers, households can buy and sell stocks between themselves without any inter-sectoral flows taking place. Inflows into the capital markets are not matched by outflows as long as firms do not issue additional securities of a value equal to the inflows into the markets, regardless of whether these additional funds are used for capital investment or for accumulating liquid reserves.

This is confirmed by the value of the turnover of shares in 2007 in comparison with the subsequent periods of high activity in 2009 and 2011—in 2007, the share price index reaches a level which is double that of the subsequent peak in 2009, while the value of shares turned over in the market is lower than that turned over in 2007. This strongly suggests that in 2009 and 2011, inflows into the market were at least partially offset by outflows as firms took advantage of the opportunity for cheap funding. In 2007, the main result of the inflows into the capital markets are simply a redistribution of wealth within the sector.

7.2.3 Government

The financial flow operations of the government are shown in Figure 7.7. These operations have been straightforward for the most part: expenditures in excess of tax receipts have been financed by the issuance of securities. At the same time, the government has accumulated deposits, in recent years apparently at a greater rate than it has been accumulating debt—hence the surplus recorded in the financial accounts. The "other" category is mostly accounted for by household payments under the item "insurance reserves"—these are most likely to be payments to government-run national insurance schemes.

7.3 The financial system

Having examined the structure of the financial and monetary flows that accommodate the surplus and deficit positions of the individual sectors of the economy,

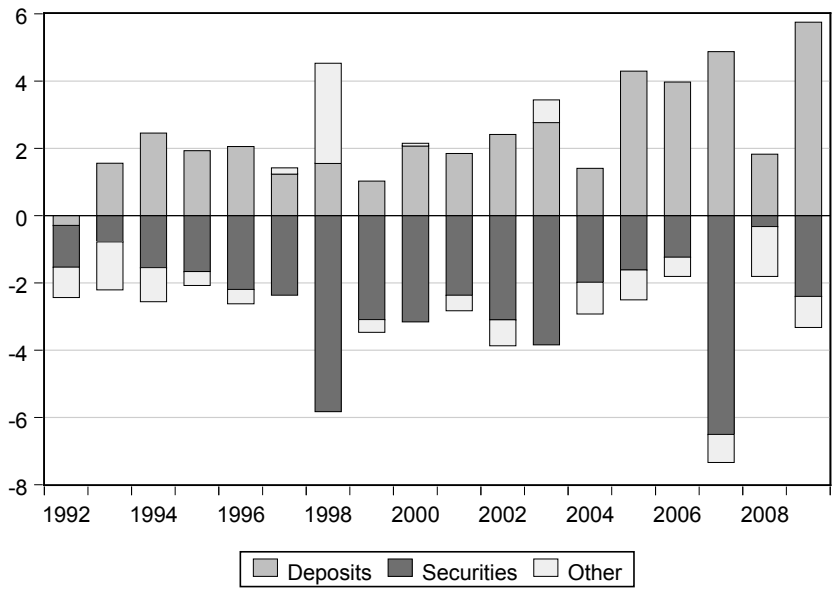


Figure 7.7 – Financial transactions of government sector, percent of GDP

Source: PBC, NBS, own calculation

the analysis now turns to the central hub of the system—financial institutions. It has already been shown that capital market transactions in China are largely insignificant for the financing of investment by firms. Bank lending is secondary in importance to the retained earnings of firms for the financing of investment and is diminishing in significance. At the same time, an increasing variety of financial instruments are entering into use and households in particular are becoming more active in the financial markets.

The financial system is therefore the key actor which intermediates between these surplus and deficit sectors. In turn, the operations of the financial system are conditioned by the regulations and policy decisions of the central bank.

The analysis therefore focuses on the financial system both in terms of its role in creating of liquidity and intermediating between surplus and deficit sectors at the macroeconomic level, and in terms of the relationship between financial institutions and the central bank. Monetary policy operations by the central bank are thus integrated with the wider macroeconomic analysis through the examination of the flow operations of financial institutions and the central bank.

In order to perform this analysis, the balance sheet of the aggregate financial institutions sector is disaggregated, as detailed in Section 6.3.2. This allows for the analysis of flows between the central bank and the rest of the banking system. The composition of these flows is contextualised by an analysis of the monetary policy operations of the PBC: the operating procedures used by the PBC were described in Section 5.3.1, while the current section analyses the use of these procedures within the frame of reference of the flow-of-funds system.

7.3.1 The financial system at the aggregate level

The starting point for this part of the analysis is an examination of the flows of at the level of the financial system as a whole. Flow-of-funds accounting serves to ensure that total flows through the aggregate financial system are equal to the inverse of the total flows of the other three sectors combined.

Total flows of the aggregate financial system are shown in Figure 7.8. Flows on the liability side of the balance sheet are straightforward: in the absence of liability management—something that is largely ruled out by the imposition of a ceiling on the rate of interest paid on deposits—the banking system passively accommodates demand for deposits and currency by firms, households and the government. The only other "source" flows for the financial system are those into securities trading accounts in 2006 and 2007.

Flows on the "uses" side of the balance sheet are more interesting. The composition of these flows demonstrates how it has been possible for the firm sector to maintain the growth of deposits and loans at close to equal rates, while significant additional deposits are simultaneously accumulated households.

Rather than the shortfall on the asset side of financial institutions balance sheet being made up by holdings of government paper—as would be the case had a government deficit been the counterpart to private-sector net saving—it is accumulation of foreign exchange reserves which has filled the gap between loans and deposits. Government securities have been accumulated by the banking system (along with those issued by firms) but the magnitude is relatively small in both cases. The largest accumulation of securities occurred in 2007 as a result of the large flows of households savings into trading accounts. The composition of these flows thus demonstrates the fundamental role that foreign exchange reserves play within the financial system: in 2005 and 2006, close to half of all deposits accumulated within the economy were not backed by domestic claims,

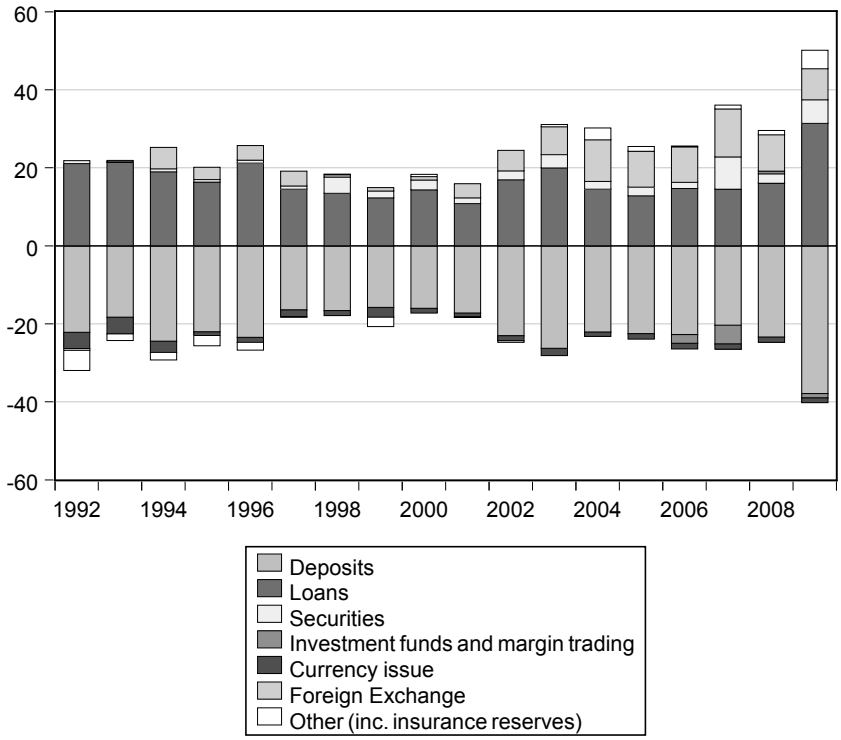


Figure 7.8 – Flow transactions of aggregated financial system, percent of GDP

Source: PBC, NBS, own calculation

but by claims on the rest of the world. In part, this reflects the falling share of total saving that is intermediated by the banking sector due to the rising share of retained earnings in investment expenditures.

The analysis now moves beyond the level of the aggregate financial sector to examine the role of the central bank in more detail. This is done using the augmented flow-of-funds accounts in which the monetary authority and banking system are separated into two separate entities. The technique by which these accounts were created was outlined in 6.3.2. Before moving on to the analysis of the disaggregated flow accounts, a discussion is presented of a number of points of relevance concerning the balance sheet of the monetary authority and the operating procedures of the PBC

7.3.2 The monetary authority

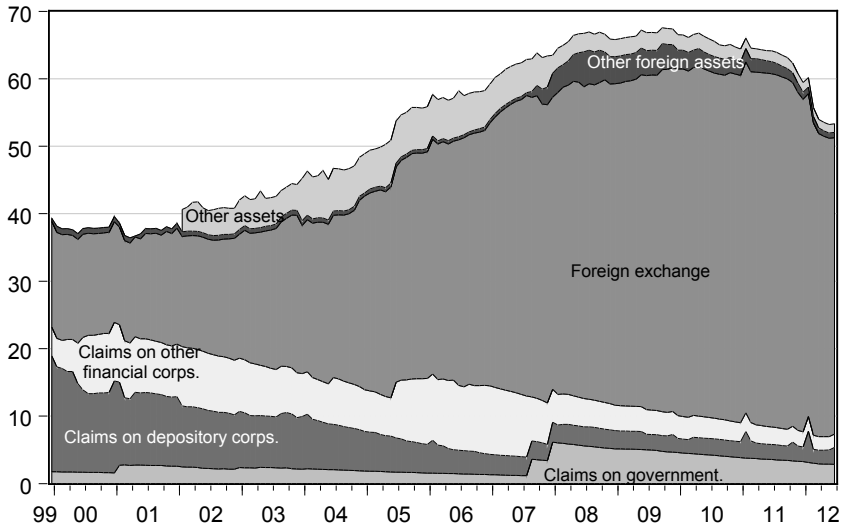
Balance sheet stocks

Figure 7.9 shows the historical composition of the balance sheet of the People's Bank of China in graphical form. This balance sheet is remarkable both in its scale, and in the extent to which it has expanded both in absolute terms and in as a share of GDP over the period of around ten years. At over 60 percent of GDP, the balance sheet of the PBC is over twice the size, as a share of GDP, of those of the Bank of Japan and the ECB, around three times the size of the Bank of England and around four times the size of the Federal Reserve. Furthermore, these balance sheets have all expanded rapidly as a result of the global financial crisis—in 2004, the balance sheet of the ECB held assets equivalent to around ten percent of GDP while the Fed and BoE held assets equivalent to around six percent of GDP.

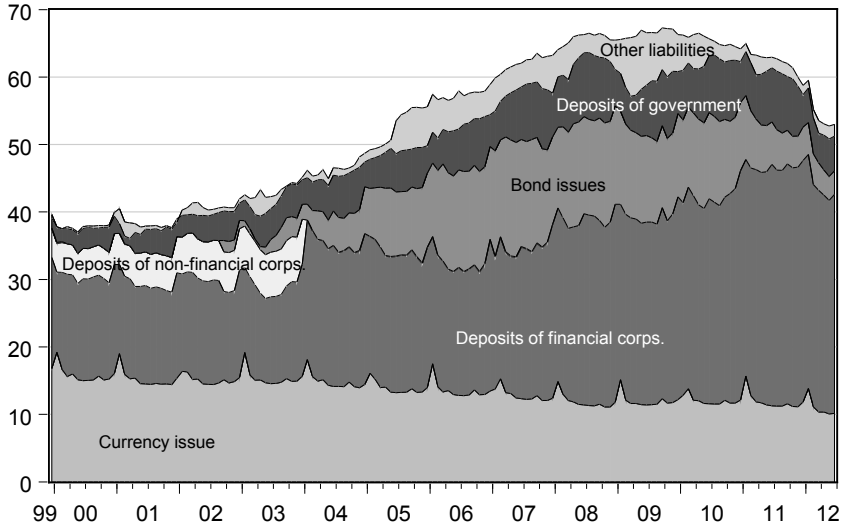
As well as being large in comparison with the balance sheets of other central banks, the balance sheet of the PBC makes up a very large, and rising, share of the total financial system of China: in 2000, the PBC balance sheet represented less than a quarter of the total balance sheet of the financial system. By 2010 this had risen to over a third.

This expansion of the balance sheet of the PBC is due to the dominance of foreign exchange holdings, as seen on the asset side of the balance sheet in Figure 7.9a. In contrast, the holdings of claims on financial institutions have diminished in significance, from almost 25 percent of GDP in 2000 to less than five percent. At the same time, deposits of financial institutions have increased from around 20 percent of GDP to peak at around 35 percent of GDP in 2010. In 2000, the financial claims and liabilities of the banking system *vis-as-vis* the the central bank were close to equal, while foreign exchange holdings were almost exactly offset by domestic currency issue. By 2010, the counterpart liabilities to foreign exchange earnings were largely composed of the deposits of the banking system, with central bank bill issuance and the deposits of government making up most of the remainder.

From this figure, it is clear that the characterisation of the Chinese banking system as "overdraft-based" (Lavoie & Wang, 2012) is problematic: the debt of the banking system towards the monetary authority has been falling consistently and is far smaller than the volume of deposits held with the central bank. It also serves to illustrate the incoherence of discussions surrounding problems of falling loan-to-deposit ratios in China (eg. Yang & Kuhn, 2007, pp. 164–165). In



(a) Assets



(b) Liabilities

Figure 7.9 – Balance sheet of the People's Bank of China, percent of GDP

Source: PBC, NBS, own calculation

a country running a current account surplus with strongly enforced restrictions on outward capital flows, a rising proportion of total financial assets held will be foreign-denominated. Since the imposition of capital controls precludes the possibility of agents holding foreign assets directly, these assets must be held on the balance sheet of the aggregated financial system, displacing loans. Unless banks turn to alternative funding sources instead of deposits, a structural current account surplus will thus inevitably lead to a falling loan to deposit ratio—rather than this being the result of an "oversupply of funds" due to excessive saving and weak loan demand.

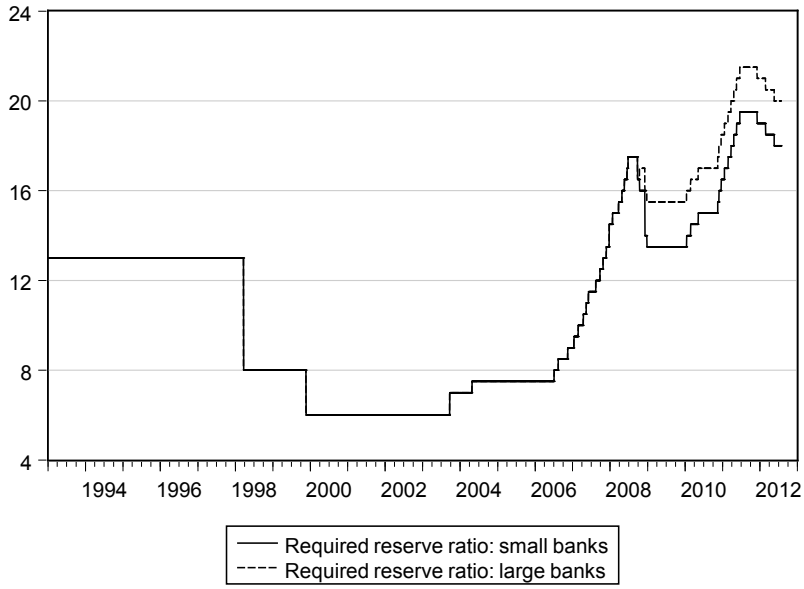


Figure 7.10 – Required reserve ratio, percent of total deposits

Source: Datastream

Bank reserves

The accumulation of bank reserves with the PBC can be attributed mostly to the imposition of high levels of required reserves, as described in Section 5.3.1. Figure 7.10 shows the historical values of the required reserve ratio over the period of analysis. The changing attitude of the authorities towards this instrument is

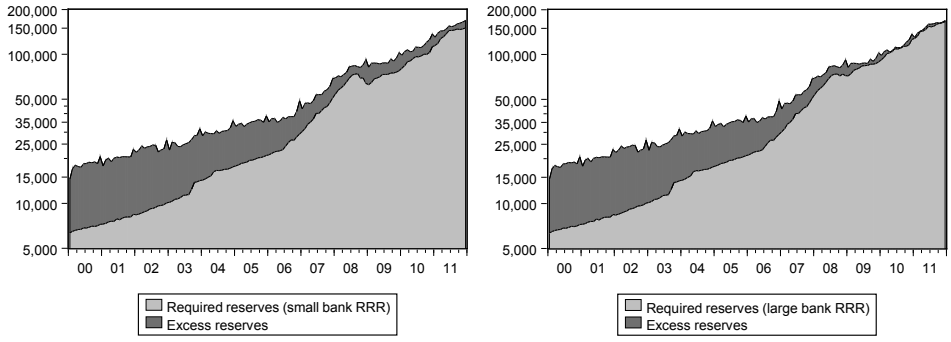
clearly visible from the sharp increase in the frequency of adjustments made to the ratio from around the middle of 2006. Up until this point the PBC had preferred the use of bill issuance as a sterilisation tool. From 2006 to 2008, the PBC followed a policy of successive raises to the RRR in response to the rising inflation that accompanied the latter part of the investment boom which started in the early 2000s (this was also the period of most intense speculative activity in the stock market). This was done in conjunction with continuing issuance of sterilisation bills.

This policy was reversed in 2008 in response to the drop in aggregate demand from exports as a result of the global financial crisis. At the same time, the PBC adopted a two-tier structure of reserve requirements such that the largest commercial banks are required to maintain a ratio of reserves 200bp higher than the rest of the banking system.[6] As was seen in Figure 7.8, the easing of liquidity in 2009, along with the stimulus measures that were introduced, led to a sharp increase in the volume of bank lending and thus deposits, primarily in the firms sector, although this did not feed through into increased investment expenditure for the most part. Instead, increased activity was seen in real estate and housing, with prices rising sharply. Thus, from 2010 the PBC began hiking reserve requirements again, becoming more aggressive in 2011. By this point the PBC had begun to allow its sterilisation bills to mature, and this policy continued into the new tightening phase reflecting the PBC's preference for reserve requirements as a monetary policy tool.

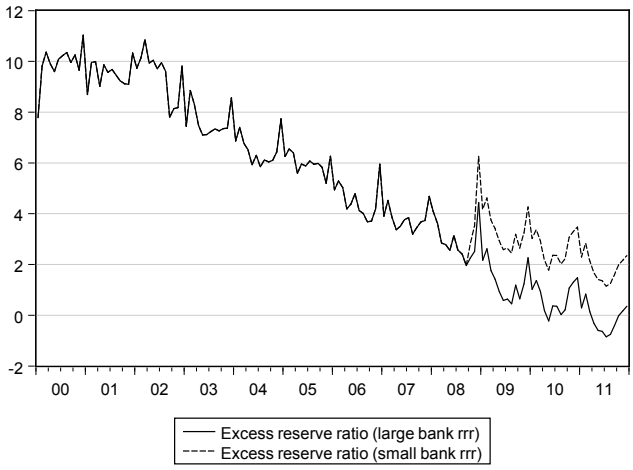
Figure 7.11 shows the effect of this sequence of hikes on the composition of the reserves of the banking system. Figure 7.11a shows the estimated levels of required reserves and excess reserves calculated using the large-bank RRR and the small-bank RRR respectively. The correct level of required reserves is likely to be somewhere between the two estimates, but without data on the volume of deposits in each category of banks it is impossible to calculate exact figures. Figure 7.11b uses the same calculations to estimate the excess reserve ratio—the ratio of excess reserves to total deposits.

Regardless of which ratio is used, it is clear that the volume of excess reserves

[6] In addition, credit cooperatives face an even lower rate, 600bp lower than the large-bank rate. Ma reports that "In early 2011, the PBC introduced a pilot scheme of 'dynamic differentiated RRR'. Under the scheme, the RRR for an individual bank varies on a quarterly, and sometimes even monthly, basis... Such differentiated and complex reserve requirements suggest that the RRR has become a multipurpose instrument of monetary, credit and macroprudential policy." (2011, pp. 10-11)



(a) Required and excess reserves, 100,000 yuan



(b) Excess reserve ratio, percent of total deposits

Figure 7.11 – Estimated composition of reserves held at PBC

Source: PBC, Datastream, own calculation

has declined steadily over the last ten years—using the large-bank required reserve ratio, the calculated volume of excess reserves turns negative in 2011. What is difficult to determine is to what extent the elimination of excess reserves is purely the outcome of these increases in the required reserve ratio, and to what extent it has resulted from other developments, such as increasing depth in the inter-bank markets, allowing for more sophisticated liquidity management on the part of banks.

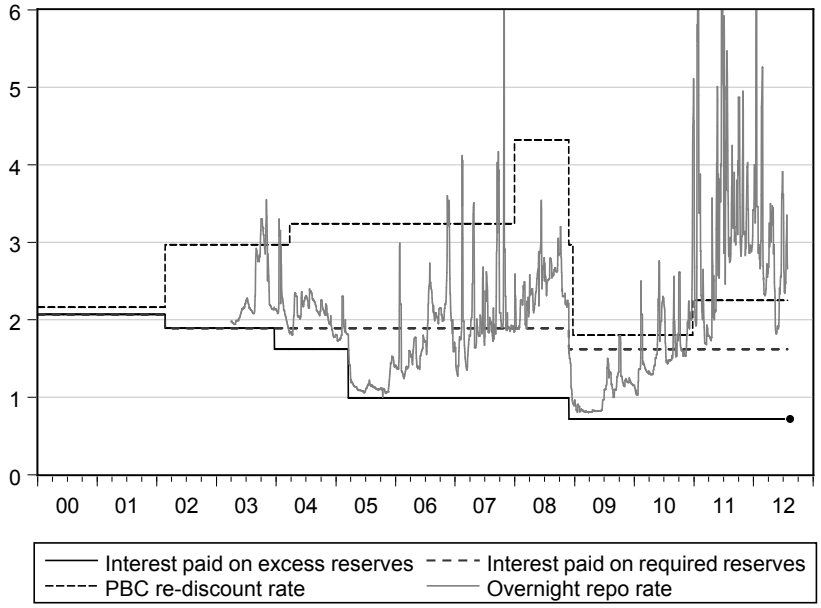


Figure 7.12 – PBC and inter-bank interest rates

Source: PBC, Datastream

Figure 7.12 shows the values of various rates of interest over the same period. The figure shows the three key rates set by the PBC on instruments used by participants in the money markets—the rates on excess reserves and required reserves, and the re-discount rate—as well as the overnight repo rate in the inter-bank market.

While the rate of interest paid on excess reserves appears to set a floor underneath the money market rate, the PBC seems unconcerned about money-market rates exceeding the re-discount rate. It even appears as if increases in the re-

discount rate tend to take place after money-market rates have breached the re-discount rate.

Figure 7.12 shows that the volatility of short-term interest rates has increased significantly, with money market rates remaining higher than the ceiling of the "corridor" for much of 2011. The loosening of policy in 2008 in the aftermath of the Lehman's crisis is also clearly visible from the drop in both market rates and the level of volatility.

It would thus appear that as PBC operations begin to restrain the availability of reserves, and banks face genuine shortages of liquidity, the same phenomena as those observed during the monetarist period in the US and UK arise in the form of rising and volatile short-term interest rates. The behaviour of short-term interest rates over the last decade or so appear to support the view that the PBC has not been using targets for base money as a means of controlling wider aggregates—it is only since 2011 that reserves have been tight enough for short-term rates to consistently breach the PBC "corridor".

This also demonstrates an example of what Borio & Disyatat (2009) have referred to as the "decoupling principle". This refers to the potential for quantities of reserves and short-term interest rates to become entirely de-coupled, in contradiction to the standard view that central banks are able to fix either the rate of interest or the volume of reserves in the system, but not both. It was noted by Lavoie (2010) that this decoupling occurred in the US in the aftermath of the sub-prime crisis: as the Fed supplied large volumes of liquidity to the inter-bank markets, the Federal funds rate could not be kept at the Fed's target rate, but remained persistently below it. Once the Fed accepted a target rate of "between zero and a quarter percent", it was free to adjust the reserves to any level desired as long as excess reserves remained within the system:

> [I]f the central bank is ready to let the overnight rate of interest drop to zero, or if there is a corridor system, it is possible for central banks to control the amount of reserves in the system, as long as they are willing to accept that the target rate of interest be set at the deposit rate on bank reserves at the central bank. There can thus be a supply of reserves that far exceeds the amount of required or demanded reserves. (Lavoie, 2010, p. 20)

The key implication of this is that the central bank is able to influence the rate of interest in the money markets, without the need to alter the volume of reserves

in the system, as long as the system is in a structural liquidity surplus. This can be seen for example in the case of the reduction of the rate of remuneration on excess reserves that took place in early 2005. In response, the repo rate immediately dropped by around 75bp., without any adjustment being made by the PBC to the liquidity of the inter-bank market.

Sterilisation flows

As discussed in 5.3.1 and the previous section, sterilisation of liquidity resulting from intervention in the foreign exchange markets has become the dominating influence on PBC monetary policy.

Standard open-economy macroeconomics in the form of the Mundell-Fleming model holds that it is impossible under a fixed (or managed) exchange rate regime to maintain control of domestic monetary policy if capital is able to flow freely. This view was crystallised in the "macroeconomic trilemma", in which countries may only choose two of the following three desirable objectives: a fixed exchange rate, international capital mobility and control over domestic monetary policy (Obstfeld et al., 2005).

Given China's policy of targeting the exchange rate, this view holds that control over domestic monetary policy will only be possible through the maintenance of capital controls. While China maintains tight controls on outward capital flows, a sequence of successive liberalisations have gradually reduced the restrictions on inward capital controls. The conventional logic would therefore posit that China's attempts to maintain control of the international valuation of the yuan will be unsustainable due to the resulting increases in domestic bank reserves. The inevitable increases in interest rates that would accompany rising inflation would induce capital inflows, further exacerbating pressure to appreciate the currency.

This view is hard to reconcile with the case of China. The PBC has targeted the level of the exchange rate over a sustained period, while continuously sterilising the associated increases in domestic liquidity. At the same time, inflation has remained fairly steady and pressure on domestic interest rates to rise does not seem to have materialised.

Further, although there appears to be evidence that the PBC has set interest rates on a number of occasions with reference to foreign interest rates rather than

domestic conditions,[7] the PBC has not lost control of domestic monetary policy, either in terms of interest rates, or the domestic money supply.

An alternative theoretical approach to the maintenance of fixed exchange rates is given by Lavoie (2001) in which the horizontalist *reflux* principle is extended to the open economy. This "compensation principle" states that fluctuations in central bank foreign exchange reserves will be automatically compensated by opposite movements to other items on the central bank balance sheets. Further, it is held that these adjustments to the central bank balance sheet will occur automatically either as a result of actions by the private sector or as a side-effect of the operations of the central bank in achieving its target interest rate.

This principle is examined for the case of China by Lavoie & Wang (2012) who performing empirical tests on the relationship between foreign exchange inflows and changes to reserve money, PBC bill issuance and government deposits. These empirical tests suggest that no relationship exists between movements in foreign exchange and base money. Significant relationships are found however between foreign exchange inflows and compensating movements in sterilisation instruments.

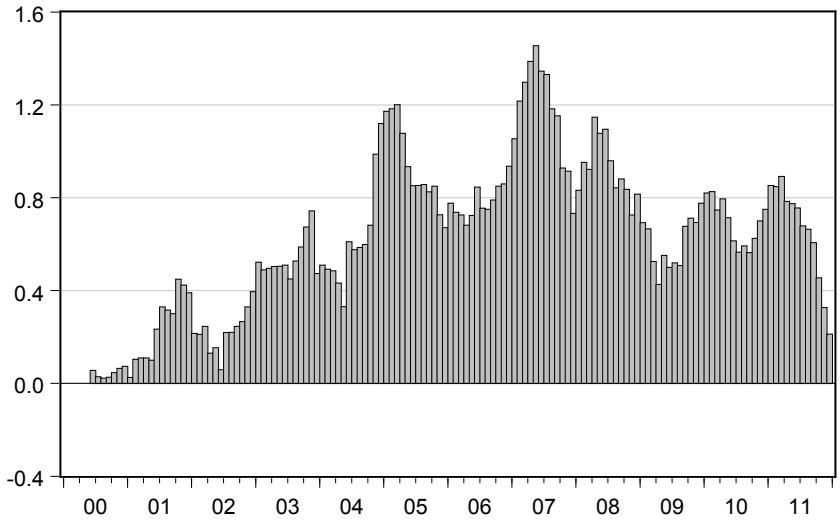
These results are slightly surprising because the effects of changes in reserve requirements are not included in the econometric specification, thus no distinction is drawn between changes in base money that are neutralised and those which are not. However this may be explained by the fact the sample used in the study ended in 2007, while reserve requirement changes only began to be used aggressively as a sterilisation tool from late 2006 onwards.

While it may be problematic to view the sterilisation actions of the PBC as occurring automatically as a side-effect of maintaining a short-term interest rate target, what does appear to be the case is that the PBC has successfully sterilised almost the entire domestic liquidity effect of foreign exchange inflows.

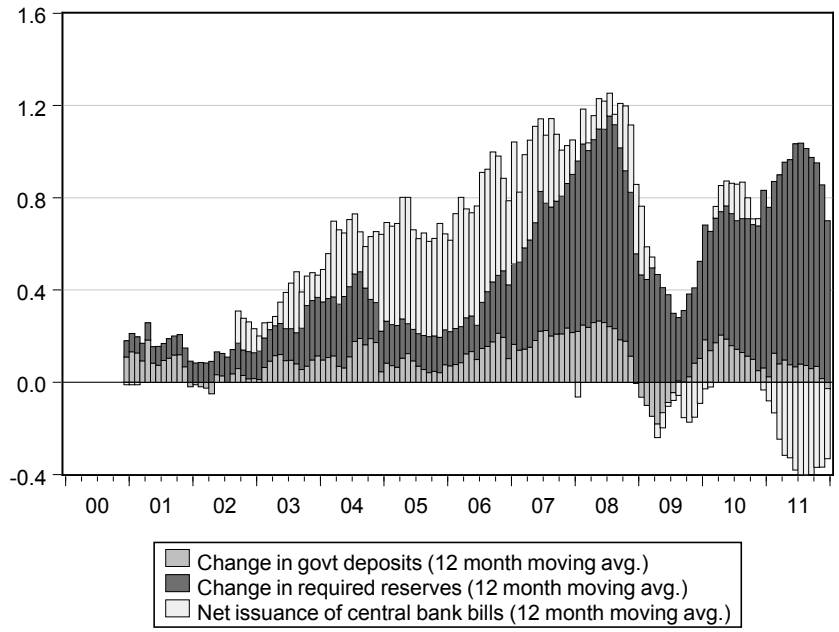
Figure 7.13 shows foreign exchange flows calculated from the changes of stocks on the balance sheet of the PBC, alongside flows of government deposits, required reserves and PBC bills. Foreign exchange flows are shown in 7.13a, while the remaining flows are shown in 7.13b.[8]

[7] In particular, during the 2005 as the currency regime was switched from a fixed peg to crawling peg system, the PBC cut key rates to low levels and only began to increase them as the US began a tightening cycle. (Nagai & Wang, 2007)

[8] Sterilisation flows have been averaged over a period of twelve months, to remove the strong seasonal nature of these flows, while foreign exchange flows have been smoothed using six-month averaging to reduce volatility.



(a) Foreign exchange flows



(b) Sterilisation flows

Figure 7.13 – Foreign exchange and sterilisation flows, percent of GDP

Source: PBC, NBS and own calculation

Three items on the balance sheet of the PBC represent possible sterilisation tools: reserve requirements, bill issuance and the deposits of government. Since foreign exchange earnings are no longer required to be fully surrendered to the authorities, these foreign exchange flows will not account for total national foreign exchange inflows. However, non-surrendered foreign exchange will have no direct effect on the domestic monetary base.

From Figure 7.13 it would appear that the sterilisation attempts of the PBC have been highly successful. The shift from bill issuance to the use of reserve requirements from around 2007 is clear, as is the subsequent easing in late 2008 and 2009 in response to the global financial crisis. The PBC essentially halted sterilisation operations at this point: the reduction in government deposits that resulting from deficit spending along with the expiry of PBC bills offset the majority of increases in reserve requirements over this period. The resulting increase in reserves served to accommodate the large increase in bank lending to firms in 2009 that was noted in Section 7.2.1. Finally, the abandonment of bill issuance as a sterilisation tool can be seen from the volume of bills that are allowed to expire during 2011, while reserve requirements continued to be raised to compensate.

One objection that is often raised to sterilisation is that it is costly, due to the spread between rates of interest on domestic and foreign assets (Zhang, 2012). In a nutshell, this argument is based on the observation that, with some portion of the total saving of a country being lent abroad as is the case in China, the rate of interest paid by foreign debtors may be less than the rate of interest prevailing domestically. In particular, if foreign claims are not held directly by households in the surplus country, but are held on the balance sheet of the central bank, the central bank may face a negative interest rate spread between the rate received on foreign assets and those paid on domestic liabilities. In turn the central bank will be forced to either incur losses which will become the ultimate liability of the taxpayer, or will seek to defray this cost through the imposition of interest spreads on the banking system for example. Whatever "cost-sharing" mechanism is used is regarded as costly and distortionary, leading to domestic mis-allocation of capital.

When considered at an aggregate flow level, this analysis appears deficient: any country which runs a surplus on current account will be extending credit abroad. If the return on these claims is lower than those obtained on domestic investment, then that share of domestic saving which has been lent abroad will inevitably earn a lower return than that which is lent domestically.

Regardless of the validity of the theoretical arguments, given the relative rates of return on domestic and foreign assets, It would appear that the interest rate spread faced by the PBC has been positive for most of the period of sustained sterilisation operations, as shown in Figure 7.14.

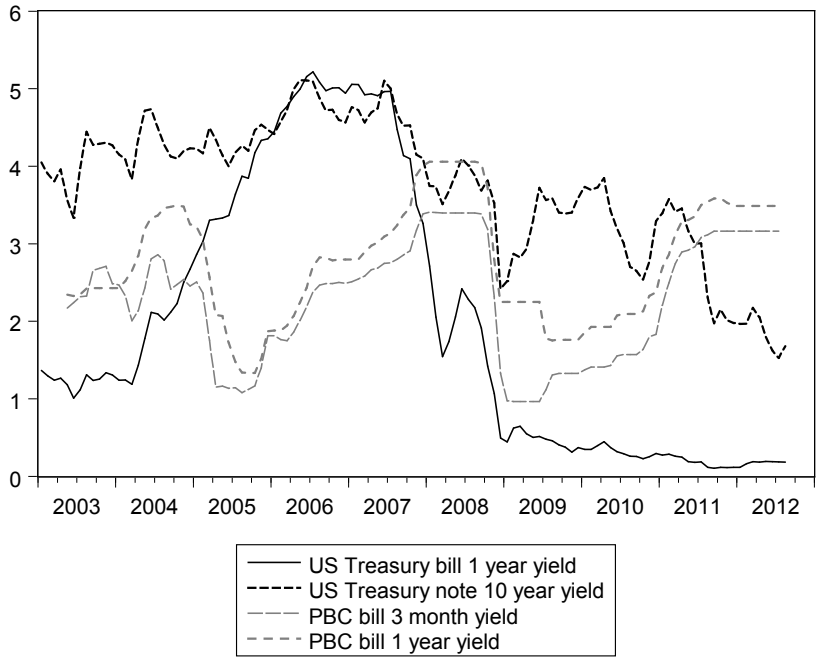


Figure 7.14 – Yields on PBC bills and US government securities, percent

Source: Datastream

The figure compares the yields on US Treasury paper at one-year and ten-year maturity with the yields on PBC bills at three-month and one-month maturities. Other than during the recent period in which the Fed's "operation twist" has reduced long-dated yields to extremely low levels, the return on PBC bills has been consistently lower than the yield on ten-year US notes, with the exception of a period in 2008 when the one-year PBC bill rate rose above the ten-year Treasury rate. For an extended period over 2004–2008, even short-dated US paper was providing a higher yield than PBC bills of a similar maturity, due to the inversion of the US yield curve in the run-up to the sub-prime crisis.

From the evidence presented here, there appears no reason to believe that the

foreign exchange inflows generated by current account surpluses have resulted in increases in the liquidity of the domestic banking sector—although the requirement that banks surrender foreign exchange to the central bank does give the PBC a mechanism by which to "force" increases in the total volume of reserves, simply by slowing the rate of sterilisation operations, as was the case in 2008-2009. Rather, the PBC has pursued a successful policy of gradually reducing the excess liquidity of the banking sector, as demonstrated by the fall in the excess reserve ratio.

It is also far from obvious why these sterilisation operations should not be able to continue indefinitely. Even if the rate of return on long-dated US paper remains at historically low levels, the switch by the PBC to the use of reserve requirements as its primary sterilisation tool enables it to pass on these low rates of return by reducing the rate of remuneration on required reserves.

Total flow transactions of monetary authority

Having examined the monetary policy operations of the PBC, the analysis now returns to the flow-of-funds. Figure 7.15 shows the annual flow transactions of the People's Bank of China. Since these figures are calculated from the balance sheet of the PBC, rather than the flow-of-funds accounts, the period shown is different to the previous flow-of-funds figures: data for the 1990s are not available, while an additional two years of more recent data are available.

For the most part, the flows shown in this figure have already been analysed in the discussion of sterilisation operations: the asset side is dominated by accumulation of foreign exchange reserves in addition to significant volumes of lending to financial institutions in 2000 and 2005-06. These lending operations appear to have been mostly reversed in the subsequent years. In 2007, the central bank accumulated a large volume of claims on the government. Since this was only partially offset by increases in government deposits, this government borrowing has been accompanied by deficit spending, generating deposits elsewhere in the banking system, and thus off-setting sterilisation operations to an extent. It should be noted that this was the year of the most significant inflows into trading accounts and equities, with financial institutions in turn purchasing large volumes of government securities.

On the liability side, the picture is largely the same as in the previous figure showing sterilisation operations, with currency issuance the only additional item.

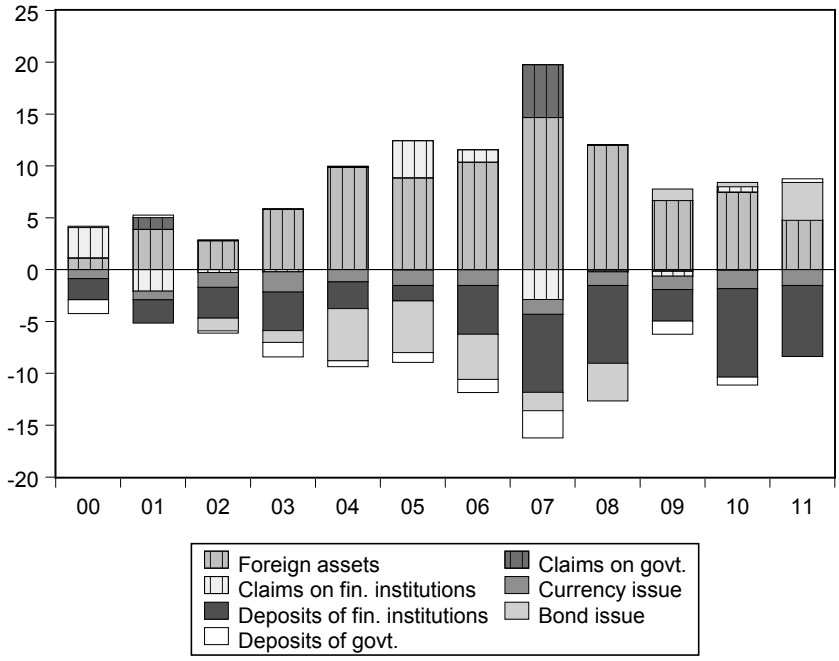


Figure 7.15 – Flow operations of People's Bank of China, percent of GDP

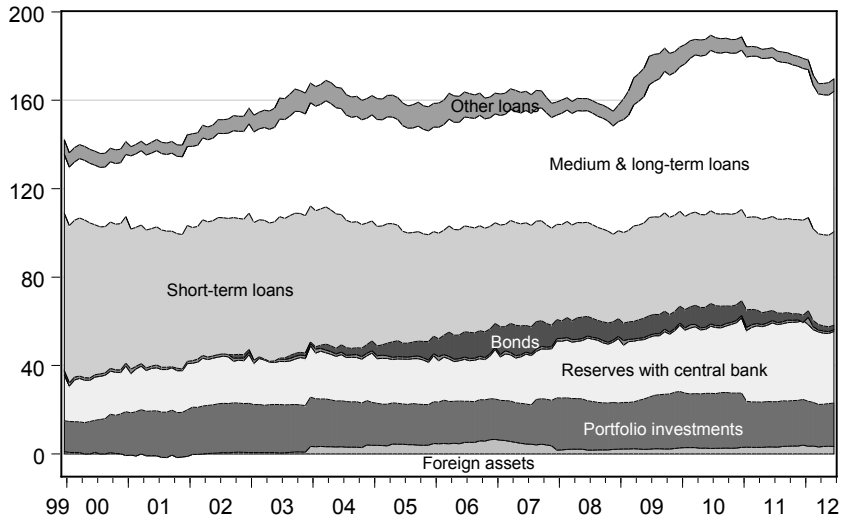
Source: PBC, NBS, own calculation

The use of bond issuance as a sterilisation tool from 2002 to 2008 is clear, followed by the switch in emphasis to reserve requirements from 2007 while PBC bills were allowed to mature in 2011.

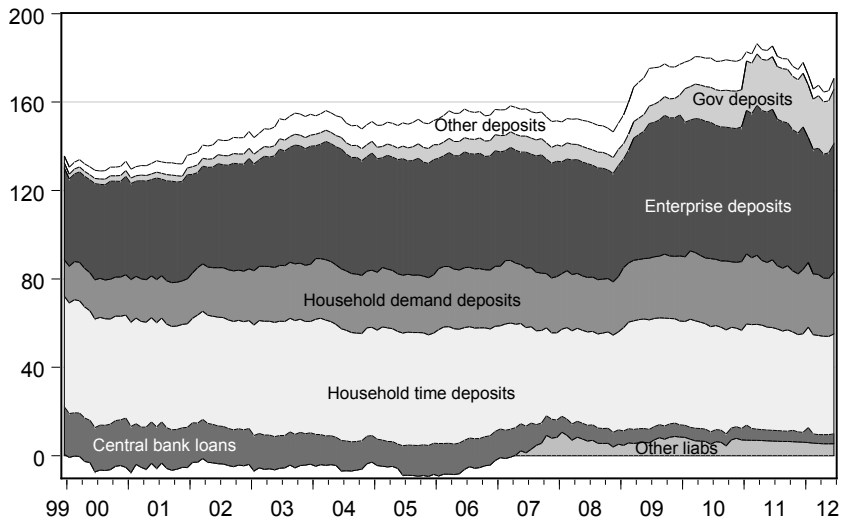
7.3.3 Financial institutions net of monetary authority

The final sector required to complete the flow-of-funds analysis is the financial system net of the monetary authority. Like the flow transactions of the monetary authority, these figures are calculated from PBC balance sheets as detailed in Section 6.3.2. The estimated time-series balance sheet for the financial institutions sector is shown in Figure 7.16.

A number of items are included in the financial flow-of-funds data which are not recorded as separate items in the balance sheets used to generate this figure, most notably the securities trading accounts. It is possible that these fall under "other liabilities"—this item makes a significant switch from negative to positive



(a) Assets



(b) Liabilities

Figure 7.16 – Estimated balance sheet of financial institutions, percent of GDP

Source: PBC, NBS, own calculation

in 2006-07, the period in which large volumes of household saving was directed towards trading accounts.

The remarkable size of the balance sheet of the Chinese banking system relative to GDP has already been remarked upon—by 2011, the total volume of deposits in Chinese banks exceeded those in US banks, at current exchange rates. What also stands out from this figure is the extent to which the Chinese authorities were able engineer a very large expansion of bank lending in 2009. As was shown in the analysis of the flows of the firm sector, almost all of the deposits created by this expansion of bank loans remained on the balance sheets of firms. This is confirmed by the balance sheet of the banking system—the increase in firm's deposits closely matches the expansion of medium & long-term loans.

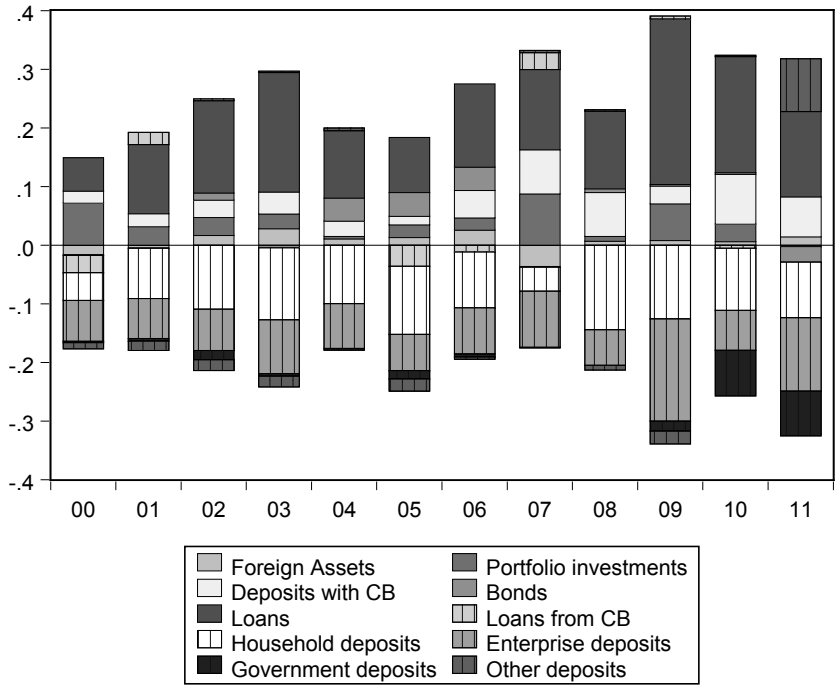


Figure 7.17 – Flow transaction of financial institutions, percent of GDP

Source: PBC, NBS, own calculation

The annual flows derived from this estimated balance sheet are shown in Figure 7.17. These flows "close" the sectoral level flow-of-funds analysis. The

income and expenditure flows of every sector of the economy have now been calculated along with the financial transactions flows generated by differences between these income and expenditure flows. The financial system sits at the centre of this system, generating fresh liquidity through the issuance of loans, and creating new deposits in the process. In doing so, the banking system requires access to liquid reserves from the central bank to cover that portion of new lending which leaves the banking system or is converted into currency.

The flow transactions of the financial system thus simply provide the mirror image of the other transactions already analysed: on the liability side, the deposits of households accumulate alongside those of firms and the government which have overtaken households in recent years.[9] At the same time, the banking system has continued to expand lending, with the difference between domestic saving and investment—the trade surplus—accounted for by accumulation of the relatively illiquid assets issued by the central bank through sterilisation operations.

Over this period, the rates of interest on the loans and deposits that make up the bulk of the balance sheet of the financial system have been tightly regulated by the PBC. The one-year lending and borrowing rates, along with the demand deposit rate are shown in Figure 7.18.

The large spread between loan and deposit rates imposed on the banking system, like the low rate of remuneration on excess reserves, is regarded by some as a form of taxation. In particular, the low and at times negative real rates of interest on deposits are viewed as placing an unfair burden on the household sector.[10] What is overlooked in such discussions is the cost to the firms sector of the large volume of loans held. As was demonstrated in Section 3.4, the cost of overcapitalisation to the firms sector as a whole is given not by the rate of interest on loans, but by the spread between deposit and loan rates. The cost to the firms sector in China of holding large volumes of deposits is thus substantial.

Furthermore, these costs are likely to be unevenly distributed across the firms sector. If, as argued in 7.2.1, loan financing of investment is concentrated in the SOE sector, while profits accumulate more rapidly in the private sector, the cost

[9] The large accumulation of government deposits in 2011 is due to a reclassification of a large proportion of "other deposits", as can be seen from the positive side of the flow accounts, and in Figure 7.16

[10] A recent IMF report on China concluded that low rates of interest on deposits were the cause of high rates of saving by households—the report recommended raising the interest rates paid on deposits as means of reducing the level of household saving (IMF, 2012).

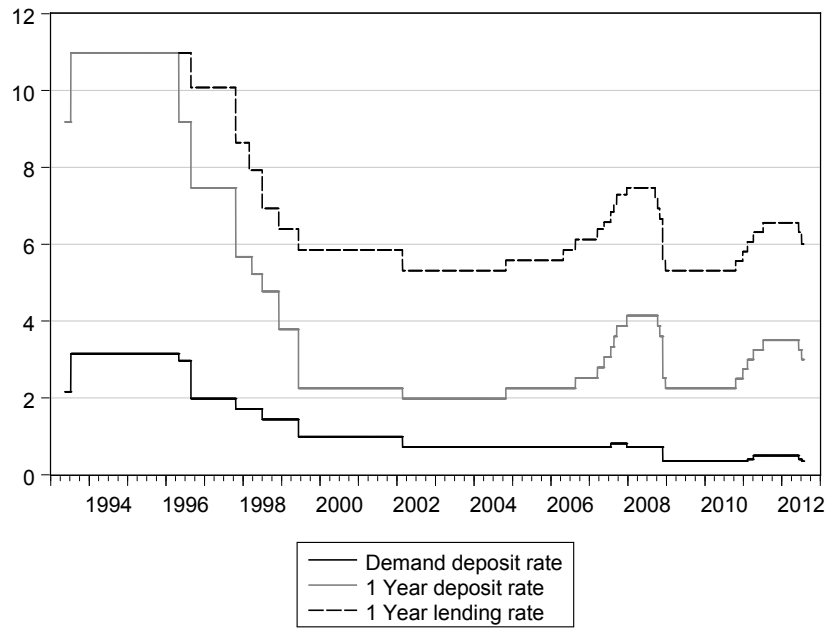


Figure 7.18 – Selected commercial bank interest rates

Source: Datastream

of financing these loans will disproportionately fall on the SOE sector, while the interest paid on deposits will accrue to to private-sector firms.

The balance sheet of the financial sector in more detail

Further detail is given in Figure 7.19 on the stocks of deposits held by each of the three main sectors. The most striking feature of this graph is the jump in enterprise deposits in 2009. The subsequent further increase in 2011, as well as the sharp increases in government deposits appear to be the result of reclassification of "other" deposits, suggesting that the figures before these reclassifications may have underestimated the shares of government and firms deposits. Also notable is the sharp drop of the equivalent of around 15 percent of GDP in household deposits over 2006–07, primarily as a result of inflows into securities trading accounts. Household deposits subsequently recover to previous levels during the stimulus of 2009.

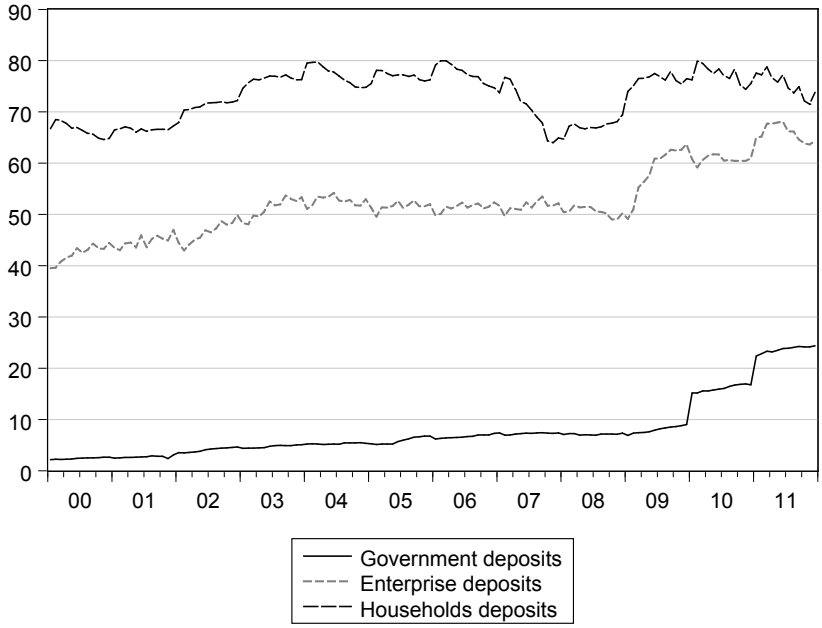


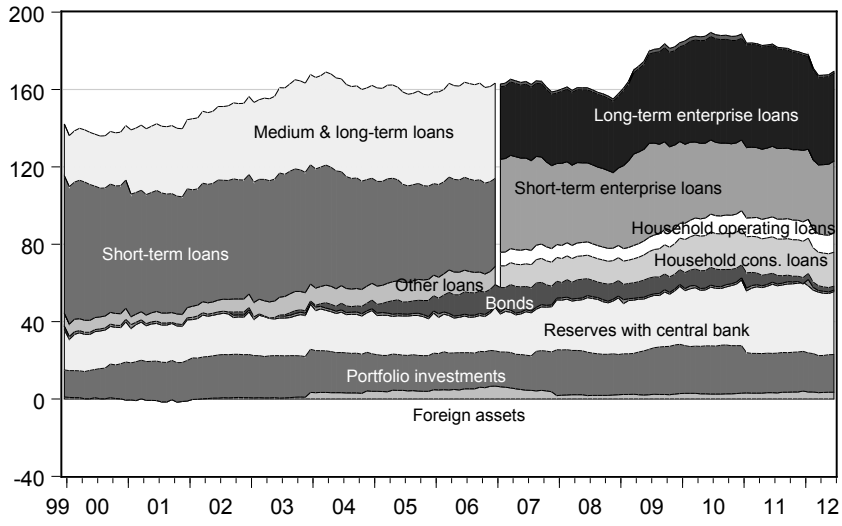
Figure 7.19 – Holdings of bank deposits by sector, percent of GDP

Source: PBC, NBS, own calculation

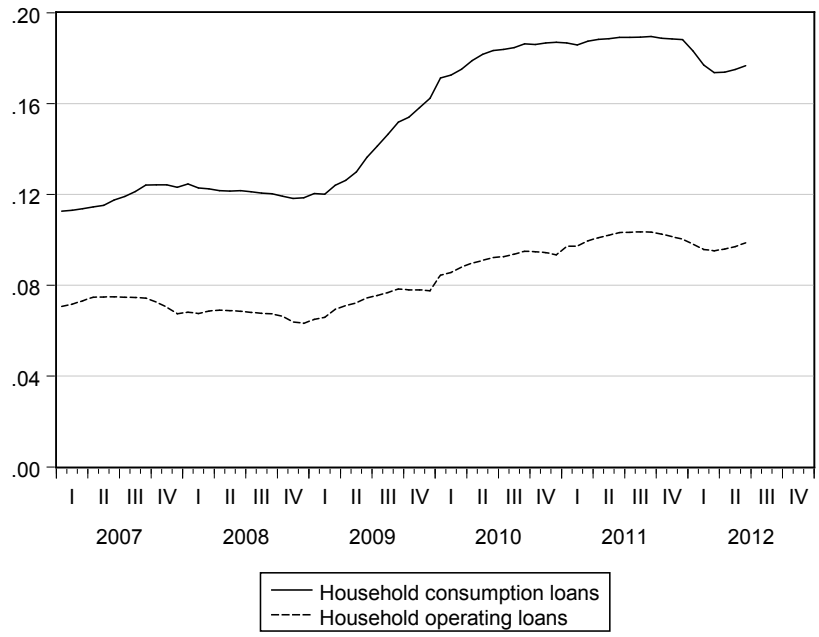
A reclassification of the aggregated balance sheet of financial institutions by the PBC in 2007 provides further detail on the asset side of banks balance sheets, and in particular on the composition of lending. The interesting feature of this balance sheet is the separation of loans into those issued to enterprises and those issued to households.

Figure 7.20 shows a decomposition of this balance sheet. Figure 7.20a combines the re-classified balance sheet figures from 2007 onwards with the previous less detailed figures from previous years into a single time series. The loans to the household sector are extracted from this balance sheet and shown in 7.20b. The rise in household consumption loans from around 2009 is readily apparent. This increase occurs at the same time as the broader expansion of lending as part of the stimulus measures.

Since the demand for credit at the household is predominantly for mortgage lending, the increase in household consumption loans provides further evidence to support the hypothesis that much of the monetary expansion that took place



(a) Assets of financial institutions in detail



(b) Loans to households

Figure 7.20 – Estimated assets of financial institutions, percent of GDP

Source: PBC, NBS, own calculation

in 2009 was directed to speculative activity in housing and real-estate.

7.4 Conclusion

This chapter completed the flow-of-funds analysis of the previous chapter by providing a detailed examination of the financial side of the accounts. As in the previous chapter, this analysis was augmented with additional data, while remaining within the conceptual framework of a stock-flow consistent taxonomy.

The analysis presented evidence of a pattern of monetary and financial flows that strongly support the hypothesis of an endogenous credit-investment process. The evidence also demonstrated that the foreign exchange inflows resulting from the trade surplus have not been the cause of increases in the money supply, as predicted by the textbook model. Rather, the increases in bank credit and deposits are the result of investment demand by the firms sector. The rising growth rate of investment, in combination with a shift in income distribution in favour of profits has resulted in a rising stock of deposits in the firms sector. Over the same period, the level of excess reserves in the banking system has steadily decreased due to the sterilisation operations of the central bank.

The analysis of the previous chapter showed that while China conformed to the "standard" configuration of investment in the firms sector being financed by the saving of households, intermediated via the banking system, the relative positions of the domestic sectors has altered over time.

In particular, despite a very high and rising share of investment spending in GDP, the deficit run by the firms sector has been falling over the period of analysis due to rising profits. Firms have thus relied less on bank credit and have increasingly financed investment out of retained earnings. This reduced reliance on bank credit for the aggregate firms sector has not however resulted in reduced demand for bank lending—rather, the result has been an accumulation of bank deposits held by firms. It is argued that this is the result of a combination of two factors. The first is the tendency for firms to hold "excess capital"—since the investment expenditures of firms generate profit income for other firms through their purchases of capital equipment, an investment boom results in an increasing volume of bank deposits circulating within the firms sector. Secondly, it is argued that this process does not result in an even distribution of deposits within the firms sector. Investment expenditures as a share of revenues are higher in the SOE sector, while the rate of profit on this investment is lower. Thus, the SOE

sector is increasingly accumulating the credit liabilities which are the counterpart to the rising deposits of the private sector.

This is particularly clear from the liabilities/assets ratios of the different firms sectors: during the recent period of high investment spending to counteract the fall in export demand due to the global crisis, the liabilities/assets ratio of the SOE sector rose significantly while falling in the private and foreign-owned sectors. At the same time the net financial position of the firms sector as a whole improved due to a large increase in the holdings of deposits. This resulted from investment spending by the SOE and government sectors accruing as profits of private firms.

Evidence is also presented of reduced dependence of the firms sector on bank credit due to funding from FDI and, increasingly, issuance of securities. These additional sources of financing were almost equal that portion of household saving not absorbed by the external balance. Thus the household saving "leakage" from firms profits was entirely absorbed by non-bank credit, resulting in the observation that changes in firms' deposits and loans followed an almost identical trajectory.

This trajectory of growth of loans and deposits in the firms sector was not matched by changes in the growth of investment, suggesting that deposits are increasingly held by firms for use in speculative activity such as real-estates purchases, rather than real investment spending. These deposits may also serve as the basis for the informal credit relationships which are increasingly used as a source of funding for those small "marginal" firms that cannot gain access to formal bank financing.

The analysis of the operations of central bank demonstrates that the growth of bank credit and deposits are not the result of loss of control of monetary policy by the central bank due to the surplus on current account and associated foreign exchange inflows. Instead, over the period of analysis, central bank operations have successfully sterilised the increase in reserves resulting from this inflow. At the same time, the increasing demand for bank credit has reduced the level of excess reserves within the banking system. The increasing tightness of credit in the interbank markets is visible in rising interest rates and volatility levels. Thus, the primary effect of the current account surplus has been through aggregate demand effects in the real sector, rather than monetary or financial channels.

Finally, evidence is presented of factors that could lead to increasing financial fragility in the household sector. Despite the rising share of income saved by households, demand for bank lending by households has risen significantly,

particularly consumption loans. The explanation for this probably lies with a combination of factors: increasing inequality of household income, speculative activity in asset markets, particularly the stock market and housing, and changes in techniques in banking leading to increased availability of consumer credit. A particularly clear-cut example of capital market inflation was shown in the case of the stock price bubble of 2007, in which household saving was diverted from deposits to stock purchases, while firms issuance of securities increased only moderately.

Chapter 8

Conclusion

This thesis presents an original characterisation of the Chinese aggregate demand and monetary circulation regime using a novel synthesis of Kaleckian-Steindlian theory and flow-of-funds accounting. An analysis of credit creation, investment and growth is presented in which firms' investment expenditures are the key driver of the dynamic evolution of the system. Steindl's analysis of the "maldistribution of profits" is updated and re-worked in the context of state control over the "cartelised" firms' sector. It is argued that the credit-financed investment expenditures of the state-owned sector have played a decisive role in generating the aggregate demand which has, in turn, been a key factor in generating and maintaining the high rate of growth of China. The pattern of investment expenditures, in concert with the specific institutional configuration of the firms sector, has conditioned the outcomes with respect to profit generation, monetary expansion and the distribution of liquidity and leverage.

The theoretical analysis is informed and substantiated by a detailed empirical examination of the processes of money creation, investment and profits over the last twenty years in China. The empirical approach, also based around an accounting framework, is closely aligned with the theoretical analysis. The flow-of-funds national accounting system is used, resulting in an integrated and coherent analytical structure in which all transactions are matched by equivalent and opposite transactions elsewhere in the system.

As emphasised in the introduction, in choosing to focus on the characteristics of the demand regime, supply side factors are largely excluded from consideration. In particular, questions surrounding issues such as productivity growth, innovation, and technological change and diffusion are left in the background. This

thesis cannot therefore be regarded as presenting full theoretical account of the recent economic development of China, but rather as providing a characterisation of the specific demand and monetary configuration which has accompanied and facilitated the Chinese development path. The depiction of a growth path led by investment spending is compatible with, and complementary to, accounts of China's development which emphasise the Kaldorian interaction between aggregate demand and productivity growth, such as that of Lo (2012).

It is argued that the theoretical and empirical system developed here, built on accounting foundations rather than the optimising behaviour of representative agents, has a number of significant advantages in the analysis of demand-side characteristics. Instead of money representing a friction which must be either justified or abstracted away, the endogenous creation of credit money for the purposes of investment expenditures takes a central role. Credit-financed investment, rather than arising automatically as result of optimisation over current and future consumption by a representative household, is determined by the ways in which different types of firms react to realised profits and excess capacity.

This analysis of credit-financed investment is synthesised with a novel reinterpretation of Steindl's stagnationist account of the inter-war period in the US. Steindl's results derived from the assumption that, with increasing monopolisation, the elasticity of the price mark-up of firms falls, leading to excess capacity. In turn, this excess capacity discourages investment leading to reduced aggregate demand and growth.

The account presented in this thesis takes Steindl's theory of stagnation as a starting point but alters the assumptions made about the determinants of investment. The analysis is founded on the premise that investment by the state-owned sector cannot be specified on the same behavioural basis as that of private firms operating either in competitive or oligopolistic markets. If the investment and pricing decisions of firms in the state-owned sector are based instead on targets for output and employment, the resulting outcomes in terms of output growth, excess capacity, the distribution of profits, and the gearing ratios of firms of different ownership type will be significantly altered.

Early attempts at formulating non-marginalist theories of growth and distribution regarded investment as exogenously determined and accommodated by changes in the real wage at constant rates of employment. At first glance, the empirical evidence on China appears to fit reasonably well with these Cambridge growth models—an increasing share of profits in national income has

accompanied a rising share of investment in output. However, by modifying the assumptions of the Kaleckian-Steindlian system as described above, an "inverse Steindlian" growth process can be conceptualised, which characterises the stylised facts of the Chinese growth experience in a more sophisticated way.

In such a system, if the state-owned sector maintains a pricing policy such that profit margins are kept close to, or slightly below, margins in the private sector, the distribution of "internal accumulation" between the two sectors should likewise be evenly distributed. With an increase in the pricing power of the private sector, profit margins will rise. In such a case, the potential slowdown in accumulation resulting from reduced aggregate demand could be offset by additional credit-financed investment by the state-owned sector. However, additional investment expenditure by the state-owned sector would result in a disproportionate increase in the accumulation of profits in the private sector, leading to a rise in the gearing ratio of the state-owned sector relative to the private sector.

In generating retained profits for the private sector, this mechanism would thus serve as a substitute for borrowing by these firms. This is significant because it is regularly reported that non-state firms face significant difficulties in obtaining credit through the official state-owned banking system. In the case that credit-financed investment by the state-owned sector were to accrue disproportionately as retained earnings to private sector firms, these firms would be able to increase investment expenditures, without accumulating the associated liabilities in the form of additional bank loans which would instead fall on the balance sheets of state-owned firms. Thus, the Kalecki-Steindl profit-reflux mechanism serves as a way of overcoming the problems of access to bank finance by small businesses.

Another important strand of the argument presented in this thesis addresses the commonly held misconception that the saving behaviour of Chinese households lies behind the growth boom of the past decades and, as a corollary, that the saving of these households is therefore related to the global imbalances in the period before the global financial crisis. If the central hypothesis of this thesis is correct—that it is loan-financed investment expenditure that is driving the growth of China—then the interpretation that seeks to draws a correspondence between saving behaviour at the household level, and saving at the national level is faulty. Nonetheless, this is the view that is drawn naturally from an analysis based on the theories of money and growth that are discussed in Chapter 2.

In the interpretation put forward in this thesis, the rising share of income saved by Chinese households serves to dampen aggregate demand, necessitat-

ing ever greater expenditure on investment in order to maintain the growth of aggregate demand, which in turn leads to greater absolute levels of saving. At the same time, the financial behaviour of households is changing. The falling level of government transfer payments as a share of national income reflects a growing dependence on non-state forms of saving for retirement and insurance. Households have increasingly begun to operate in financial markets, both indirectly through insurance and pension providers, and directly—as exemplified by the stock market bubble of 2007. At the same time, household borrowing from the banking system has gone from virtually non-existent to representing a significant share of total household financial activity over a short period. Without further research, it is impossible to know for certain what lies behind this development, but it seems reasonable to posit some combination of inequality of wealth and income, rising property prices, speculative behaviour in asset markets, and changes to the way that commercial banks operate.

These phenomena pose challenges for the implementation of monetary policy. This thesis has demonstrated that the view that China has operated a system of base money targeting, in line with monetarist doctrines, is misleading. The banking system has maintained a position of excess liquidity for the whole of the period of analysis. Instead of attempting to restrict supplies of bank reserves, the authorities have tended to use direct intervention at the level of both banks and state-owned firms as a way of keeping credit growth in check.

A number of developments will make the task of the central bank more complex in this regard. Firstly, the dynamic process by which credit-financed investment leads to rising holdings of bank deposits in the private firms sector will serve to reduce the influence of the central bank—regardless of whether this influence is exerted through the setting of interest rates or through more direct controls. Secondly, as emphasised in Chapter 5, rather than a smooth path of convergence on the perfect financial markets of the New Keynesian system, financial development is a process which takes place through historical time. The resulting financial structures that arise out of this process are conditioned by the economic and political environment in which they are embedded. In this respect China may be viewed as having drawn benefits from maintaining significant control over the banking system during the transition from a mono-bank system to a modern commercial banking system. Although widely regarded as a source of inefficiency and distortion, the banking system has provided a key lever of control for the Chinese authorities.

However, as demonstrated by the increasing prevalence of informal credit relationships in China—from kerb-side lending organisations to the proliferation of off-balance-sheet structures created by the large banks—financial development represents a deeply endogenenous process, driven by privately generated credit relationships. It is evident that with each additional round of bank-financed investment expenditure, the control of the authorities over credit aggregates is weakened. The prevention of destabilising speculative behaviour will become ever more difficult.

The Chinese authorities thus face significant obstacles in maintaining growth at such high levels. A slowdown has so far been avoided through a combination of factors. The inelasticity of investment demand to excess capacity has so far served to maintain aggregate demand and offset rising saving, and has stimulated ongoing increases in productivity. The rapid adoption and diffusion of new technology, much of which has been imported from abroad via the Chinese external sector, has ensured that the goods produced as a result of this investment have continued to find a market. Recent external surpluses have provided a further addition to aggregate demand.

However, the international cost structures which have led to the current account surpluses will not last indefinitely. Without a shift back towards a more egalitarian distribution of income, the diminishing share of consumption demand in national income will increasingly drag on demand. With financial liberalisation and innovation, the potential gains from speculative financial operations will increasingly appeal to firms in possession of high levels of liquidity. Thus, the maintenance of aggregate demand and growth though continued real investment expenditures and export demand is likely to become increasingly precarious.

In Steindl's view, the pre-war stagnation of the US economy was explained in the following terms: "the economy is unable to adjust to low growth rates because its saving propensity is adapted to a high one." (1979, p. 1) The rising share of income saved by all sectors in the Chinese economy implies that the saving propensity of the economy as a whole is undoubtedly adapted to a very high rate of growth. With the inevitable transition to lower rates of growth that will accompany the maturing of the Chinese economy, the question that remains is whether this transition can be achieved without significant dislocation. With the shift from planning to a market based system, the Chinese economy will inevitably have to face the fundamental contradiction that lies at the heart of any investment-driven growth regime:

> Investment considered as expenditure is the source of prosperity, and every increase of it improves business and stimulates a further rise in investment. But at the same time every investment is an addition to capital equipment, and right from birth it competes with the older generation of this equipment. The tragedy of investment is that it causes crisis because it is useful. Doubtless many people will consider this theory paradoxical. But it is not the theory which is paradoxical, but its subject—the capitalist economy. (Kalecki, [1939] 1990, p. 318)

While the Chinese economy may not yet be characterised as capitalist, this does not diminish the significance of Kalecki's point. Investment results in additional productive capacity—as long as this capacity remains substantially underutilised, whether due to insufficient spending power, or to an inelastic propensity to save, the potential for crisis rises with each additional increase in investment. Whether the Chinese economy will be able to successfully navigate these potential dangers remains to be seen.

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