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Measuring corporate diversity in financial services: a diversity index

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ABSTRACT

This paper provides a measure of corporate diversity in financial services. Our index is based on four components: ownership; competitiveness; balance sheet structure/resilience; and geographic spread. The first of these sub-indexes measures ownership diversity based on the Berry index of diversification and the Gini-Simpson index of biodiversity. It captures the extent of diversity in ownership types – for the UK, banks, mutuals, and the government owned National Savings & Investment – where each of these have different objectives, creating diversity in behaviour. Our second sub-index captures the extent of competition, and is based on the inverse of the Hirschmann-Herfindahl index of concentration. Our third sub-index measures diversity in balance sheet structures and resilience across the financial sector. Our final sub-index captures the extent of geographic spread and the regional concentration of financial services. These indicators are combined into a single index – the D-Index – that measures diversity in financial services. The D-Index shows a marked decline in the run-up to the 2007–2009 financial crisis, followed by further falls during 2008 and 2009. Since then, the index has remained more or less flat. We are no closer to creating the conditions – of diversity – to avoid a repeat of the 2007-2009 global financial crisis.

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1. Introduction

In the aftermath of the 2007–2009 global financial crisis, researchers, governments and regulators examined the structure and characteristics of the financial services sector to understand the causes of the crisis and ways of averting a recurrence. One of the key findings to emerge from this research was that corporate diversity is an important and hitherto neglected source of systemic stability and resilience.[1] A number of studies have highlighted the link between different aspects of corporate diversity and the stability of financial systems. For example, Haldane and May's analysis of the sources of systemic risk in banking systems identifies diversity *across* the financial sector as a key factor that promotes systemic stability:

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> . . . in the run-up to the crisis, and in the pursuit of diversification, banks' balance sheets and risk management systems became increasingly homogeneous. For example, banks became increasing reliant on wholesale funding on the liabilities side of the balance sheet; and managed the risks using the same value-at-risk models. This desire for diversification was individually rational from a risk perspective. But it came at the expense of lower diversity across the system as a whole, thereby increasing systemic risk. Homogeneity bred fragility . . . (Haldane and May 2011, p. 355)

A similar argument has been expressed by Goodhart and Wagner (2012, p. 1) who note that,

> . . . the biggest institutions are now operating in the same global markets, undertake similar activities, and are exposed to the same funding risks. . . . This lack of diversity is very costly for society. Similar institutions are likely to encounter problems at the same time. This makes systemic crises – such as the crisis of 2007–2009 – more likely.

Whereas Goodhart and Wagner (2012), Haldane and May (2011) and NEF (2015) highlight the relationship between diversity and systemic stability, Kay (2012) views the diversity-stability relationship as part of a broader question regarding competition in banking, arguing that competition extends beyond traditional measures of market structure, such as firm numbers and market share, to related notions of plurality and diversity:

> There is less of a need for more banks than there is for more diversity of banks. Our problem is not simply that there are not very many banks, but that to most people they all look the same . . . I think they [the new Financial Conduct Authority] should have a primary obligation to promote competition. Implied in the promotion of competition is the promotion of diversity, because for me the essence of competition is not just that several people do things. It is that people try to do things differently. If they do them well, these things get imitated. If they do things badly, then they bear the consequences. That is how competition creates progress. Kay (pp. 7–9)

While the recent interest in diversity has been triggered by concerns over financial stability there is also a well-established literature that examines the impact of ownership diversity on consumer welfare and efficiency (see for example Llewellyn 2009; Heffernan 2005). In addition, there is a significant body of research that looks at the geographic distribution of banking and the effects of spatial concentration on consumer welfare, business growth and innovation (Baer and Mote 1985; Lord 1992; Marshall et al. 2000; Martin and Turner 2000; Leyshon, French, and Signoretta 2008; Alessandrini, Presbitero, and Zazzaro 2009; Gardiner, Martin, and Tyler 2012; Campos 2012).

The growing recognition by researchers and policy makers of the importance of diversity raises the important question of how to measure diversity in the financial services sector. Diversity is a multifaceted concept including differences in: corporate forms and objectives; firm size and the degree of competition; funding strategies and business models; and geographic spread. Measuring diversity and tracking its movement over time is therefore a complex task. The purpose of this paper is to analyse and calibrate these different aspects in order to construct an index of diversity for the financial services sector. The index may be used to explore the impact of diversity on financial stability, pricing (interest rates) and consumer welfare.

In the following section we consider the nature and role of diversity in the financial services sector, focusing on key aspects identified in the academic literature: (i) ownership diversity; (ii) concentration and competitiveness; (iii) different funding models; and (iv) geographic concentration of financial services. Section 2 discusses the theoretical

foundations of these different aspects of diversity in financial services. Section 3 shows how these may be measured and sets out our empirical results and analysis, including the presentation of our resulting Diversity Index: the D-Index. Section 4 considers an application of key components of the index – corporate diversity and competitiveness – on interest rates and consumer welfare. The final section draws some conclusions.

2. The role of corporate diversity in financial services

The financial crisis of 2007–9 focused attention on the relationship between diversity and systemic instability. However, the relationship between diversity and stability is multi-faceted, reflecting the different dimensions of diversity and the various impacts of these on the behaviour and performance of the financial services sector. In this section we consider these different aspects of diversity – ownership diversity, competition, balance sheet resilience, and geographic spread – and the relationships between them in order to explore the theoretical dimensions and foundations of diversity in financial services.

2.1. Ownership and corporate diversity

A key distinction between different corporate forms is between mutual organisations owned by their members (in the financial services sector, generally their customers, but may also be the employees and/or the communities in which the firms operate), and commercial banks owned by shareholders. These two main types of incorporation and ownership have different business models and modes of behaviour – with mutuals adopting a stakeholder-value business model and shareholder-owned banks adopting a shareholder-value business model. These two different broad forms of ownership are associated with different business objectives (reflected in an organisation's Articles of Association), with the PLC banks aiming to maximise profit for owners, or shareholder value, while the mutuals – owned by their customers – aim to maximise consumer utility. Heffernan (2005) and Hesse and Cihak (2007) consider the behaviour of cooperative banks or mutuals, on the one hand, and commercial banks or PLC banks, on the other. Both studies confirm differences in behaviour across these two types that are inherently related to their form of incorporation. Heffernan (2005) used the natural experiment of the UK Building Societies Act 1986, which paved the way for building societies to convert to banks, to see if it was possible to discern differences in behaviour pre- and post-conversion. If these two modes of incorporation do indeed lead to differences in business behaviour then Heffernan posits that post-demutualisation we should observe a rise in the spread between lending rates and LIBOR, and deposit rates and LIBOR. It should be noted that these inherent differences in pricing behaviour may not materialise under conditions of perfect competition where both corporate types should price at cost (except insofar as the private banks have an additional cost of having to return dividends to shareholders, whereas for a mutual this 'dividend' may take the form of lower consumer prices). But under imperfect competition or oligopoly – which is the case in banking – we would expect to see differences in behaviour in addition to the above point regarding dividends. Hence, there are clear links between corporate form, behaviour and competition which we consider in more detail below. Heffernan's empirical analysis shows that

the pricing behaviour of building societies *did* change post-demutualisation, and that their lending and deposit rate spreads, as converted building societies raised margins after demutualisation.

Hesse and Cihak (2007) findings are consistent with Hefferman's study although their focus is different, being concerned with the effect of cooperative banks on financial stability. Hesse and Cihak (2007) find that cooperative banks exhibit lower returns and lower volatility in their returns over the cycle. This increases financial stability and average bank stability, although it makes banks that are already weak more vulnerable. Hesse and Cihak's results on systemic stability and the performance of mutual and cooperative banks were confirmed by two major studies by Ayadi et al. (2009, 2010) that compare financial systems across Europe, and which find that mutual and co-operative banks tend to have: lower volatility of earnings than do shareholder- and privately-owned banks; a lower risk profile; and were less affected by the banking crisis than were shareholder- and privately-owned banks.

The main systemic benefits to be derived through diversity were found by Ayadi et al. (2009, 2010) to include:

(i) Systemic stability by virtue of having institutions that manage risks differently (and through the lower risk-appetite of mutual and co-operative banks).
(ii) Enhanced competition via different business models.
(iii) Mutual and co-operative banks tend to be less prone to short-termism via the pressure of maximising shareholder value over a short time horizon.
(iv) Mutual and co-operative banks are more likely to be locally based.

These findings – most of which were reinforced by a subsequent EU Expert Study Liikanen (2012) – suggest that there are indeed links between corporate form, business models and geographic concentration.

2.2. Competition

There has long been a recognition that the UK banking sector has been dominated by a few large banks (see Baer and Mote 1985; ICB, Kay 2012; OFT, 2010; Beck 2008; OECD 2011; Vives 2011). Concern over lack of competition in banking led the government to set up the Cruikshank review which found that there were 'competition problems' in all the financial markets investigated, and that shareholder returns in banking were excessively high (Cruikshank 2000, p. viii and Annex C, p. 207). Similar conclusions were reached more recently by the House of Commons Treasury Committee (2011) and by the Independent Commission on Banking. For example, the HoC Treasury Committee notes that:

> Like the Independent Commission on Banking we consider there is 'a tendency, all else equal, for markets to be less competitive when more concentrated'; it is legitimate to be concerned about the state of competition in the retail banking sector'. (2011, p. 20).

The effects of market structure on both systemic stability and consumer welfare were also a central concern of the Independent Commission on Banking which concluded that:

> . . . there have been long-standing problems with competition in UK retail banking markets, resulting in competition being both insufficient and misdirected". Independent Commission on Banking, 2011, p. 197.

Until recently, concern with competition in banking was focused on the extent to which market concentration might inhibit competition, resulting in higher prices (and/or lower quality) for consumers, economic inefficiency, and deadweight welfare loss. However, the post-2007 financial crisis has focused attention on a further aspect of the concentrated nature of the financial sector: namely, the 'too big to fail' problem – which had been recognised as an issue previously, but for which the practical implications were brought home with devastating effect during the course of the 2007–2008 global financial crisis and subsequent global recession of 2009 – the first global recession since the 1930s. (For earlier discussion of the 'too big to fail' issue, see Hetzel 1991; Stern and Feldman 2004). This turns on the idea that large banks receive an implicit subsidy because depositors and other creditors expect them to receive more government support in the event of a crisis. Hence, banks with a large market share benefit not only from their dominant market position which may enable them to exercise market power, but also from two further effects: (i) the ability to borrow more cheaply in financial markets as creditors perceive a higher prospect of government subsidy for large banks and lower risk; and (ii) actual government subsidies in the case of failure. Thus, market concentration has a snowballing effect that enables large financial institutions to increase their market share still further as a result of these 'too big to fail' effects. A third effect on market structure and competition is the possibility of post-crisis mergers, which may lead to additional increases in market concentration.

The 'too big to fail' argument shows that the effects of market concentration in the banking sector extend beyond questions of competition, to questions of risk and systemic stability. Large banks have more market power and face an insurance structure that encourages them to undertake risky activities, knowing that the activities of these banks (and their creditors) are ultimately underwritten by the taxpayer. However, the extent to which large financial institutions take excessive risks is limited by different regulations for different corporate forms. For example, the Building Societies effectively have their loan to deposit ratios more tightly regulated via legislative limits on their lending and funding than is the case for shareholder-owned banks. We explore this aspect of funding and associated risk in the following section, but here it should be noted that there are further links between ownership type, competition and funding models.

Increased competition (which often corresponds to a reduction in the degree of concentration) has the potential to bring positive benefits to consumers; but whether it does so will depend on the *type* or *nature* of that competition, and on whether the competition is *sustainable*. Thus, some of the new entrants to the mortgage market during the run up to the 2007–2009 financial crisis actually exacerbated the problem – of the unsustainable credit bubble – rather than alleviating it; this they did by taking excessive risks in the sub-prime market, which contributed to the causes of crisis. The 'competition' created by these firms thus proved to be transitory, with the ensuing crisis resulting in consolidation and a significant increase in concentration (reduction in competition).

2.3. Balance sheet structure and resilience

In the years preceding the 2007–09 financial crisis there was a noticeable convergence in the funding models used by financial institutions with banks shifting their funding models from retail deposits to wholesale funding. This trend was discernable across many countries, including the UK, the US and Germany and has been identified as a major factor contributing to the 2007–2009 global financial crisis for an analysis of US bank failures, for an earlier review of funding models used by German banks, and for an analysis of the UK case). In the UK, a contributory factor to the convergence of funding models was the 1986 Building Societies Act, which made it easier for building societies to 'demutualise', becoming banks, leading to a loss of corporate diversity and a loss in funding model diversity. The process was exacerbated by the development of the sub-prime market and by the entrance of 'other specialist lenders' into the mortgage market. These lenders funded mortgages not from retail deposits but from wholesale financial markets with the effect, as the ICB has noted, of stimulating other lenders to follow suit. Hence, banks adopted individual strategies that resulted in the sector becoming more homogenous in terms of their funding and business models. The concomitant decline in funding model diversity led, as Haldane (2010), Haldane and May (2011) and Goodhart and Wagner (2012) noted, to higher systemic risk that exposed the system to crisis.

A key source of funding model diversity is corporate diversity. The mutual sector, which is subject to legislative constraints on the proportion of non-member funding it can raise and therefore faces different effective requirements on its loan to deposit ratios, provides a natural firewall that has the effect of setting a floor to the funding gaps observed across the sector as a whole. The strength of this source of resilience depends on the extent of corporate diversity, illustrating that these two aspects of diversity – ownership, and funding model – interact to shape the overall level of diversity and risk in the system as a whole.

2.4. Geographic spread

The geographic concentration of financial services can have both direct and indirect effects on the performance of an economy. Direct effects are related to the employment and income generated in the sector and its geographic spread or concentration. Indirect effects spring from the pivotal role that the financial services sector plays in providing finance to industry and consumers, which in turn has a significant impact on the development of the non-financial sector and the housing market.

The direct effects are fairly easy to capture by looking at the geographic spread of banking activity. Financial intermediation services is one of the most geographically concentred industries in the UK (Campos 2012) being heavily concentrated in the City of London and the surrounding Greater London area. In 2011, London accounted for around 38% of full-time employment in the monetary intermediation sector, up from around 32% in 1998.[2] However, the concentration of the UK financial services sector in London may be measured not just in terms of the day-to-day economic activity of the sector, which is best captured by employment or output, but also by the concentration of strategic decision-making power. Over recent decades the branch networks of financial

institutions have become less regionally based and there has been a tendency for registered Head Offices to gravitate towards London. This has arguably led to indirect effects as London-based financial institutions have shifted their focus away from the regions, towards London and international markets.

Tenenbaum and Waters (2011) sought to assess whether local and non-local banks played a similar role in the sub-prime market in the US and found that local banks had a smaller proportion of their lending in their sub-prime market compared with non-local banks in the US. Part of the explanation for these differences lies in the fact that local banks had better information on their customer base and greater understanding of their needs. In terms of financing for business, particularly small and medium sized enterprises, Alessandrini, Presbitero, and Zazzaro (2009) and (Alessandrini, Presbitero, and Zazzaro 2010) show that increased geographic concentration of financial services in Italy increased the financial constraints faced by local firms, especially small firms. For an analysis and discussion of the regional imbalances in the UK economy, most especially in the financial services sector, see Gardiner, Martin, and Tyler (2012).

2.5. The benefits of having a diversity of ownership forms

There are strengths and weaknesses in all business models, ownership structures, and governance arrangements. The great strength of the PLC model is its ability to raise capital – thanks to the granting of limited liability, which originally was seen as the *quid pro quo* for the benefits to society from the corporate purpose – whether that was building railroads or investing in industrial capacity – but which today is rather taken for granted. Family-owned businesses may have a loyalty to the local community as well as to the future integrity of the business itself. State ownership can take the long view, whether at national or regional level. And mutual ownership is able to give a 'sense of ownership' to its stakeholders – by actually giving real ownership, which can engender trust and, in the case of consumer-owned mutuals, a focus on the quality of goods and services being provided to the customer. The case for diversity and plurality in the financial system is greater than the case for any particular model, and in the absence of a perfect model, the best option is to encourage diversity, which has generic advantages in terms of firstly enhanced competition (and hence consumer welfare) that derives through different business models, and secondly systemic stability, where, for example, one of the factors that lay behind the 2007–09 financial crisis was that individual institutions had been diversifying and while this might be thought to reduce risk, it does not if all are diversifying in the same way, which instead makes the system as a whole become less diversified – a process that was described well by Haldane (2009, pp. 18–19).

More generally, in a situation of uncertainty, there is a case for diversity, as it is impossible to judge which model is best in all future circumstances. As The Economist notes:

> Just as an ecosystem benefits from diversity, so the world is better off with a multitude of corporate forms. (The Economist, 2010, p. 58)

The importance of diversity raises the question of how to measure it, and we turn to this in the following section.

3. Measuring corporate diversity in financial services

In this section we provide measures of the four dimensions of diversity in financial services discussed above, and show how they can be combined to provide an overall diversity index that captures the ability of the financial system to withstand systemic shocks, and to contribute to the economic welfare of the economy and society more generally. We combined the various contributory indices so that they take a higher value when they are contributing more strongly to these desired outcomes. Greater corporate diversity is reflected in a higher value of our 'corporate diversity' index. Greater geographic diversity is reflected in a higher value for our 'geographical diversity' index, and this reflects a system serving the economy and society better. Increased competition – of the right type – can contribute to economic welfare, so our 'concentration' index takes a higher value when competition is strengthened (and concentration falls). And finally, an increased spread of balance sheet structures away from the relatively safe and resilient will make the system less secure, so we construct the indices to take a lower value when this happens, and a higher value when the spread of balance sheet structures moves towards the more stable, representing greater resilience.[3]

3.1. Ownership and corporate diversity

When considering corporate diversity it is important to distinguish *firm diversification*, from *corporate diversity*. Firm diversification reflects the range of different products or services provided by an individual firm. In contrast, corporate diversity captures the relative importance of different corporate forms or types across an industry or sector. The extent of firm diversification depends on the number of products or services provided by a firm and their relative weight in the firm's total output. The Berry index of firm diversification[4] is perhaps the best-known measure of firm diversification, though other measures have been used by Gort (1962), Utton (1977), Jacquemin and Berry (1979) and Gollop and Monahan (1991). The Berry index is constructed by identifying each product (or service) produced by a firm, p_k, where p denotes production and the subscript k denotes the number of product types, k = 1, 2, 3, ..., m, and calculating their weighted shares in the firm's total production, weighting each share by itself. The resulting index is then subtracted from 1 to give:

$$B = 1 - \sum_{k=1}^{m} p_k^2$$

The Berry index of firm diversification, is constrained to lie between 0 and 1 and is increasing in product diversification, so that the larger the number of products produced by the firm, the higher the index and the greater the degree of inequality in the product mix, the lower the index.[5]

The distinction between firm diversification and corporate diversity is an important one, especially in banking where there are spillover effects from each individual bank's risk to systemic risk. Full diversification within a firm reduces risk for that firm, but if all firms move in the same direction this may lead to increased systemic risk. For any individual firm, risk is spread by diversification. Intuitively, this is equivalent to the 'don't put all your eggs in one basket' argument. By supplying a wider range of services or

financial products, firms in the financial sector are able to spread risk. However, for the industry as a whole risk is spread by having different types of firms specialising in different activities. One of the trends that has emerged since 'big bang' in the UK and the repeal of the Glass Steagall Act in the US, is an increase in firm diversification as banks became enabled to engage in a wider range activities. This has led to banks becoming more similar as they each diversify into the same set of activities. Commenting on this trend Haldane and May (2011), Kay (2012) and Goodhart and Wagner (2012) have called for a reduction in firm diversification and an increase in corporate diversity – which again begs the question of how to measure corporate diversity.

As far as we are aware, prior to Michie and Oughton (2013) there were no existing measures of corporate diversity that captured different types of corporate behaviour as described and discussed above. However, indexes of diversity across types or groups of a population have been developed in the biological sciences. Simpson (1949, p. 688) defined a concentration index of types or groups within a population as:

$$\lambda = \sum_{j=1}^{z} \pi_j^2$$

where π_j represents the share of the total population that belongs in each of the z groups or types.[6] This has been subtracted from 1 to give the Gini-Simpson Index of Diversity as:

$$D = 1 - \sum_{j=1}^{z} \pi_j^2$$

This is similar in structure to the Berry Index of Diversification discussed above which captures the extent of product diversification within firms. To the best of our knowledge, the Gini-Simpson Index of Bio-Diversity was not used before Michie and Oughton (2013) to measure corporate diversity – designed to capture diversity across corporate types (as opposed to biological species). Applying this index to corporate forms gives an index of corporate diversity based on the number of corporate forms and their respective market shares. This raises the question of how to distinguish between different corporate forms. Our definition is based on two criteria: (i) the form of incorporation; and (ii) the business objectives of each form. Within the banking sector it is possible to distinguish three main corporate types: 1. Private banks limited by shares, for example, Barclays; 2. Mutual banks and building societies, owned by their members or customers, for example Nationwide; and 3. Publicly owned banks, such as NS&I. The picture was complicated when a number of shareholder-owned banks came under full or partial public ownership as they were bailed out by the government during the 2007–2009 financial crisis, but as we shall see, this change in ownership – with the government effectively holding either a major stake, a majority stake, or all of the company – failed to lead to a change in objectives, and instead their aim remained that of profit maximisation – rather than the maximisation of consumer welfare. In short, while the structure of share ownership changed, the business model did not.

A central feature of the measurement of corporate diversity is the identification of distinct types of corporate forms. For there to be genuine diversity there must be inherent, discernable and lasting differences in corporate objectives and behaviour. These differences spring from the form of incorporation (and articles of association) of the different corporate types. The main objective of shareholder-owned and privately-owned banks is to run a commercial enterprise for profit. This is often interpreted as profit maximisation or more recently as maximising shareholder value. In contrast, the main objective of building societies is to maximise the welfare of their customers. Finally, the aim of the National Savings and Investment Bank (NS&I) is neither to maximise the return to shareholders or the welfare of its customers and owners. Rather NS&I was set up by government in 1861, originally as the Post Office Savings Bank, with the objective of encouraging saving by providing secure accounts in order to generate a source of funding for government. This remains its primary objective today. Unlike the Banks and Mutuals, NS&I only operates in the savings market; it does not provide loans or funding except to the government.

These distinct corporate forms are recognised by the National Statistics Office, and data on deposits and mortgage lending are published by these different categories. Using these data we constructed a corporate diversity index for the UK retail deposits market and the UK mortgage market. The Corporate Diversity Index (CD) for the retail deposits market, CD_d is given by,

$$CD_d = 1 - \sum_{j=1}^{z} \delta_j^2$$

where, j = 1, . . . z, denotes the number of distinct corporate forms and δ represents the share of deposits held by each of the three types – Banks, Mutuals and NS&I. We constructed a similar index for the mortgage market, CD_m

$$CD_m = 1 - \sum_{j=1}^{z} \mu_j^2$$

where μ denotes the market share of mortgages held by banks and mutual respectively.

Since the 1980s the financial services sector has become more homogenous as the shareholder-owned banks have increased their share in both the deposits market and the mortgage market. The 1986 Building Societies Act was a key factor underlying this change as it made it easier for building societies to convert to banks. In the mortgage market, the Building Societies used to supply around 60% of the market. Since then that figure has fallen – to 20% in 2000 and around 16% in 2011 – representing a significant loss of diversity. Chart 1 tracks the degree of corporate diversity in the financial services sector since 2000 (where 2000 = 100), measured from both sides of the balance sheet, namely deposits (including non-interest-bearing accounts) and mortgages (loans for residential property). As can be seen, there has been an almost continual loss of corporate diversity on the mortgage (loans) side of the industry since 2000. The falls in 2001 and 2002 reflect the entrance of three new banks into the market – Paragon, GMAC-RFC and iGroup – who took market share from the Building Societies augmenting the share of the

dominant group of commercial banks. This group of lenders also introduced a new funding model as they financed their mortgage lending not from deposits but from wholesale money markets.

In the run up to the financial crisis of 2007–09, the banks continued to take market share from the building societies and though the index stabilised during the crisis, it fell sharply in 2009–10 as the banks became more dominant.[7] The decline in corporate diversity in the mortgage market was not matched by a similar decline in the retail deposits market, where corporate diversity remained fairly constant between 2000 and 2007. In the deposits market the financial crisis caused a movement of savings deposits away from shareholder-owned banks which were identified as having difficulties, notably Northern Rock, Bradford & Bingley and HBOS banks, and into mutuals and National Savings & Investments, which thus reduced the dominance of the shareholder-owned banks and created a concomitant increase in corporate diversity between 2007 and 2008.[8] However, the increase in diversity in the deposits market proved short-lived, and ownership diversity on the deposits side of the market has since declined back below its initial level in 2011 as banks clawed back their market share in deposits, in order to return to more conventional funding models.

In large part, the different time paths of ownership and corporate diversity in the mortgage and deposits sides of the market reflect the fact that the shareholder-owned banks adopted a new and more risky funding model, financing mortgage lending not from deposits but from wholesale markets. Northern Rock's business model epitomises the most extreme version of this new model and illustrates the associated impact on systemic risk and social welfare. However, the effect on social welfare is felt not only through the impact on systemic risk – it also has an impact on the cost of borrowing as historically the banks have higher mortgage-deposit rate spreads than the building societies. As a result, the decline in diversity resulted in a loss of consumer welfare.[9]

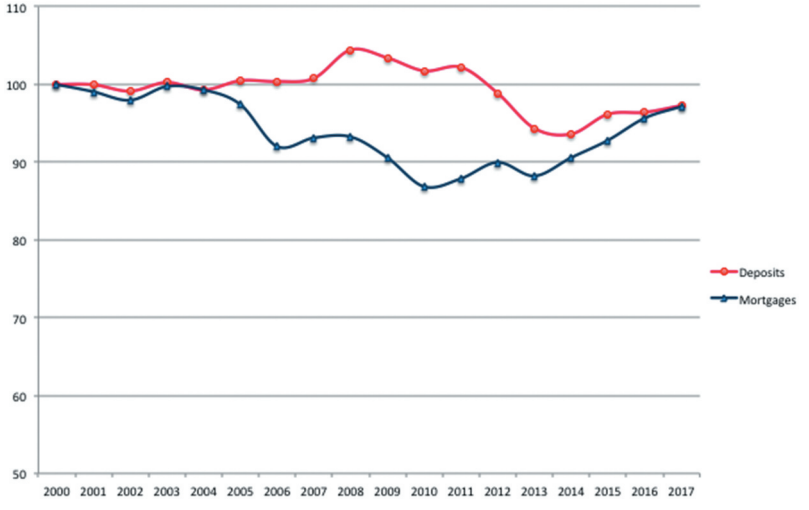

Chart 1. Ownership index: banks, mutuals and NS&I.
Source: own calculations (see Section 3.3 below). The index has been set to equal 100 at the start of the period in 2000 and this is the case in all Charts below except charts 3 and 4.

3.2. Market competition: too big to fail?

Market structure or concentration is normally measured by the *Concentration Ratio*, or the Hirschmann-Herfindahl Index. The 5-firm concentration ratio (C5) may be defined as the ratio of the retail deposits (or mortgages) of the largest financial institutions to the total market for deposits (or mortgages) respectively. For example, C5, measured in terms of deposits, is attained by ranking all banks and mutuals from largest to smallest according to their deposits, identifying the deposits of the five largest, and dividing the collective holding of these five largest by the total deposits in the sector as a whole:

$$C5_d = \frac{\sum_1^5 d_i}{\sum_1^n d_i}$$

In this equation the subscript, i, denotes firms, where i = 1, 2, 3, . . . , n; where n is the number of firms in the industry. This measure gives equal weight (one) to the five largest institutions and zero weight to institutions outside the top five. Theoretically, it lies between 5/n and 1, or expressed as a percentage, between close to zero and 100%.[10] The 5-firm, or 4-firm concentration ratio is frequently used because it only requires data on the top 4 or 5 firms and the market as a whole, and because it is intuitively easy to understand. However, its limitations are that it fails to pick up inequality within the top 5 or within the tail (firms outside the top 5) of the distribution. A more comprehensive measure is the Hirschman-Herfindahl (HH) index, named after the economists who derived the index. This looks at the individual market share of each firm in a market, s_i, and combines these into an index by weighting each firm's market share by itself:

$$HH = \sum_{i=1}^{n} s_i^2$$

The HH index depends on the number of firms and the market share of each firm or the degree of inequality in firm size, and it lies between 1/n and 1. For competitive industries with a very large number of firms the lower bound of the index approaches zero, while in the case of a pure monopoly the index equals 1. The index is decreasing in the number of firms or competitors in an industry and increasing in the degree of inequality or concentration of market share across competitors. The HH index is superior to the Concentration Ratio as it looks at the entire distribution of market shares and therefore places greater weight on inequality. However, it has the limitation that it requires much more data than the 5-firm Concentration Ratio (C5).[11] Despite this, it is widely used in theoretical models of oligopoly, as well as in empirical and policy related research.

For example, the index has been used by competition authorities in the US and Europe (including the UK). The European Commission and the Office of Fair Trading's (OFT) guidelines on merger use a threshold value of HH > 0. 1 to define an industry as concentrated, and HH > 0.2 to define it as highly concentrated.[12] For the purposes of devising an index that increases as the degree of competition

increases we subtract the HH index from 1 to give an index of market competition or competitiveness, so that a fall in the index represents a fall in competition and a rise in the index shows an increase in competition.

In addition to its policy applications, the HH index has been used extensively in theoretical research on oligopoly and there is a large body of work that considers the relationship between industry concentration and market power. A key finding that flows from theoretical models of competition and oligopoly is the profits-concentration relationship based on the mathematical derivation of a direct relationship between the HH index of concentration and the Lerner index of monopoly power (Cowling and Waterson 1976, 1976, 268–9), such that the higher the HH index in any industry, the higher the profitability (*ceteris paribus*) as measured by the Lerner index or profit margin, of that industry.

3.3. Evidence from the UK financial services sector

We calculated the HH index of concentration for both the UK retail deposits market and the mortgage market between 2000 and 2018 using data on over 30 banks and building societies that together comprised around 95–99% of the UK markets for retail deposits and mortgages.

The HH in the UK retail deposits market rose from 0.082 to 0.117% between the years 2000 and 2011. Much of this increase occurred after the 2007–2009 financial crisis as a result of restructuring and merger activity in the financial sector. The picture in the mortgage market is more complex. The HH concentration ratio fell from 0.095 to 0.090% between the years 2000 and 2007 as new entrants, such as Lehman's entered the mortgage market and Northern Rock grew its share aggressively – taking market share away from the largest banks and the Nationwide Building Society. However, post-2007 there was a marked increase in the ratio as these firms exited. This together with the merger of Lloyds TSB and HBOS in 2009 saw the HH rise from 0.090 to 0.141 between the years 2007 and 2010.

Chart 2 reports the degree of market competition in the sector, that is, the inverse of the degree of concentration as measured by (1 – HH), for the UK mortgage and deposits markets.

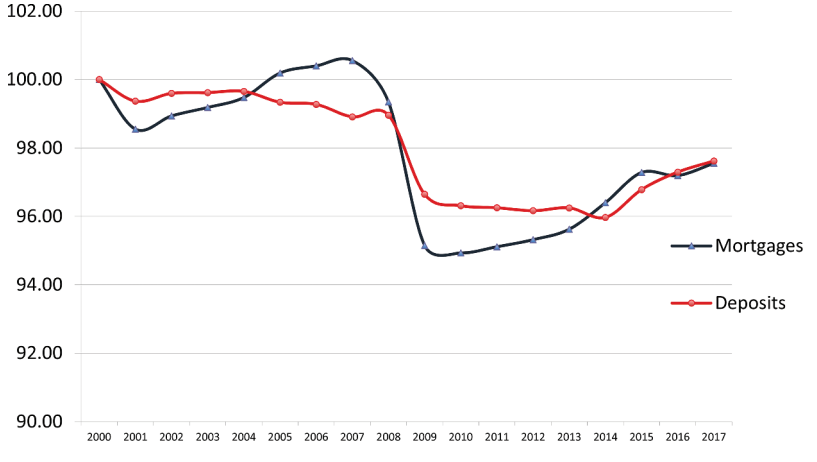

Chart 2. Competitiveness index: mortgage balances outstanding and UK deposits.
Source: Own calculations using data on mortgages and deposits of banks, building societies and NS&I as described in Appendix 1.

In the run up to the 2007–2009 financial crisis new providers entered or expanded their activity in the mortgage market – including Lehman's and other 'sub-prime' providers – classified together with other financial institutions as 'other specialist lenders' by the Bank of England (for an analysis of which, see Hall 2004). These banks differed from traditional banks not in terms of their form of incorporation or objectives but in terms of their funding model, lending long in the mortgage market and financing this, not from deposits but from borrowing in wholesale financial markets. The entry of sub-prime lenders led to a rise in the competitiveness index above its 2000 level to a peak in 2007. However, following the outbreak of the financial crisis, the market became significantly more concentrated as sub-prime lenders, such as Lehman's crashed out of the market. Concentration increased further following the merger of HBOS with Lloyds resulting in a significant rise in the HH indexes in 2009 and a fall in its inverse (the competitiveness index) to a low point in 2009 as seen in Chart 2.

Looking at the (1-HH) index for the deposit side of the market it can be seen that the increase in competition on the mortgage side of the market that occurred in 2004 to 2007 was not matched on the deposit side, with competition falling markedly since 2004. This difference reflects the funding model of the 'other specialist lenders' who made more extensive use of the money markets to fund mortgages. While this new funding model started with new entrants, incumbent banks imitated it and it quickly spread to many other financial institutions – see the section on balance sheet structure below – as part of what the ICB has described as 'a race to the bottom'.

The ICB's analysis underlines the importance of distinguishing between 'good' competition and 'incautious' or 'bad' competition, 'that exploits customer unawareness or, for example, creates a race to the bottom on lending standards'. ICB (2011, p. 153). To be effective, competition must be sustainable; one of the lessons to be learned from the development of the sub-prime market and new funding models is that 'bad' competition can result ultimately in more, rather than less concentrated market structures. The funding model adopted by new entrants was unsustainable and as the ICB (2011, p. 163) noted, '[w]hen the crunch came, the incentives for risk-taking went into reverse with calamitous effects'.

In terms of the values of the raw HH index underlying the data in Chart 2, the data indicate that both the deposit and mortgage markets are 'concentrated' on the OFT definition. However, there are differences in the evolution of the HH index across the two markets. In the deposits market the HH index lies close to 0.1 between 2001 and 2006, before rising above 0.1 (the threshold used by competition authorities to indicate that a market is concentrated) in 2007 and increasing to 0.136 in 2011 – its highest level over the period studied. In the mortgage market, the HH index follows a more cyclical pattern, starting at just below 0.1 in 2000, rising above 0.1 between the years 2001 and 2003, before falling to 0.88 in 2007 as new entrants entered the market, and then rising again from 2008 as many of the same new entrants exited. In 2011, the index stood at 0.139, well above the level used to define a concentrated market.

Analysis of these data shows that market structure – or the degree of concentration – is just one aspect of competition, and other aspects include the objectives and behaviour of financial institutions, and their funding models. These two dimensions are captured by our measures of corporate diversity (discussed above) and funding model diversity (discussed below).

3.4. Balance sheet structure and resilience

The way in which balance sheets across the financial system evolve indicates the approaches managements are taking in running their businesses, the connections they have to other institutions, and the risks they face as an industry.

One key risk that became apparent in the crisis was that of funding risk, as firms that were reliant on wholesale funding – particularly on short maturities – found they were not able to roll over their funding lines. To the extent that financial institutions borrowed this funding from other banks, the increased use of wholesale funding also reflects a greater interconnectedness in the system, which added to its fragility when problems struck. We therefore look at the extent to which the system did indeed move towards this less resilient model.

Here the building societies tend to be an 'anchor', in being prevented both by their corporate purpose and their legislative environment from taking much risk. In the build up to the 2007–2009 financial crisis, there was of course a growth in more risky financial behaviour and activity – hence the verdict of the Governor of the Bank of England and others that banking needed to once again become 'more boring'. One indicator of the different funding models used by banks at different time periods is the customer funding gap. The funding gap is measured as the difference between loans and deposits expressed as a proportion of total loans, that is: (Loans – Deposits)/Loans.[13] In the case of financial institutions that do not hold UK retail deposits this ratio is equal to 1, while in the case of financial institutions that do not lend all of their deposits, the ratio will be negative.

Chart 3 shows the funding gap for major UK banks and mutuals for the period 2000–2011. It can be seen that the minimum funding gap – which reflects the business models of the mutuals – remains fairly constant rising gently until 2005 and falling back to around −0.2 thereafter (the dip in the minimum value in 2010 reflects the splitting of Northern Rock into Northern Rock PLC and Northern Rock Asset Management). In contrast, the maximum value rises sharply, before stabilising at a high level close to or equal to its maximum value of 1.[14] The median follows an inverted U-shaped pattern peaking in 2006. The changes in the funding gap reflect an increase in the use of alternative funding models, with banks, in particular, funding loans from money markets to a greater extent. The most well-known and extreme examples of this funding shift was Northern Rock, but other banks followed a similar, albeit smaller shift in their funding model. This shift in funding models *could* be seen as an increase in diversity in banking models and to the extent that diversity adds stability, it should therefore be

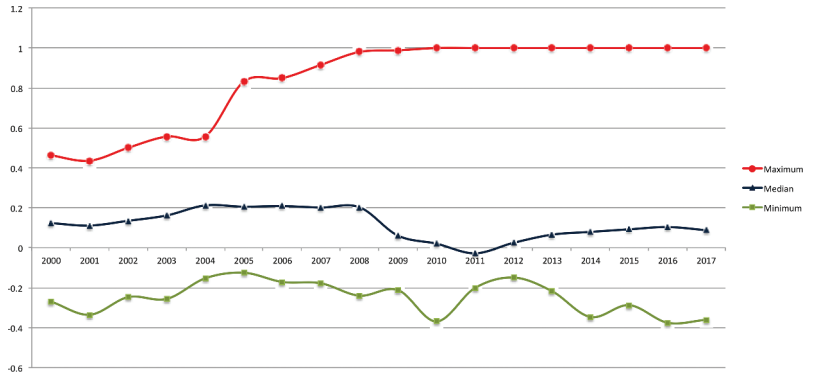

Chart 3. Major UK banks and mutuals customer funding gap as a proportion of customer loans and advances.

a good thing. However, there are two reasons why this is not in fact the case. Firstly, the shift reflects a move towards a more unstable and risky banking model. Secondly, as can be seen from the figure, the bottom end of the distribution (the minimum value) is unchanged, while the top end (maximum) rises. As this happens, funding models are becoming more concentrated at the higher end as the use of wholesale funding increased at larger institutions in particular. This process has been described by the ICB thus: 'Incautious lenders gained business at the expense of more cautious lenders, and hence exerted pressure on the latter to follow suit'. ICB (2011, p. 163)

To see this more clearly we constructed a concentration index in loan/deposit ratios that can be subtracted from 1 to give an index of funding model diversity. The HH (Loan/Deposit) concentration index measures the sum of the weighted shares of each bank or mutual's loan to deposit ratio in the sum of the loan to deposit ratios for the sector as a whole. The concentration index is based on the standard Simpson, HH formula and is defined as,

$$HH_{LD} = \sum_{1}^{n} \left[\frac{\left(\frac{l}{d}\right)_i}{\left(\sum \left(\frac{l}{d}\right)_i\right)} \right]^2$$

A diversification index based on this can be constructed by subtracting HH_{LD} from 1. The HH_{LD}concentration index, shown in the equation above, falls as the number of banks and mutuals rises – reflecting greater diversity and lower risk as lending becomes less concentrated, and spread across a greater number of lenders. If the share of each financial institution's loan to deposit ratio in the total were equal for all banks and mutuals then the index takes a value of 1/n, where n is the number of banks and mutuals. If the loan to deposit ratios of banks are unequal and the share of those with higher loan to deposit ratios dominates, then a rise in higher loan to deposit ratios results in a rise in the index – reflecting a greater concentration in funding models, with a higher loan to deposit ratio, greater risk, and less resilience.

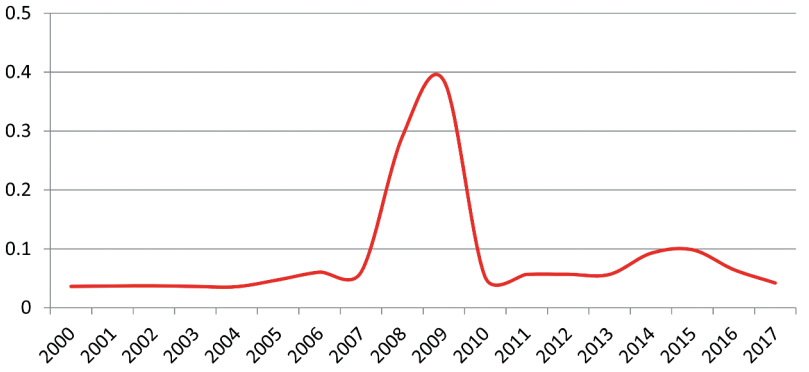

Chart 4. The Hirschmann-Herfindahl index of funding model concentration; market concentration of loan to deposit ratios.

As can be seen from Chart 4, this is indeed what happened. The HH Loan to Deposit concentration index rose significantly between the years 2004 and 2007 (by around 70%) but these changes are dwarfed by the massive rise in loan to deposit ratios between 2007 and 2009.[15] This jump is caused by a very dramatic increase in the loan to deposit ratios of a few institutions – for example, Northern Rock and Bradford and Bingley who experienced an outflow of savings and associated increases in the loan to deposit ratios. But even if we remove these outliers we find a significant increase in concentration – reflecting a move towards higher loan to deposits ratios.

Charts 3 and 4 tell the same story, namely that loan to deposit ratios rose as a result of increases at the top end of the distribution of loan to deposit ratios. The financial system had become less stable. However, whereas Chart 3 points to a higher spread of funding models which could be viewed as greater diversity, Chart 4 makes clear that actually loan to deposit ratios had become more concentrated towards the upper end of the size distribution – so there is actually *less* diversity of funding models in the system.

In order to capture funding model diversity we combine these two dimensions with equal weight using the diversity counterpart of the HH Loan to Deposit concentration index, D_{LD} given by:

$$D_{LD} = 1 - \sum_{1}^{n} \left[\frac{\left(\frac{l}{d}\right)_i}{\left(\sum \left(\frac{l}{d}\right)_i\right)} \right]^2$$

and the inverse of the funding gap spread (FGS) as a measure of resilience:

$$\frac{1}{FGS} = \frac{1}{\left[\left(\frac{L-D}{L}\right)_{MAX} - \left(\frac{L-D}{L}\right)_{MIN}\right]}$$

to yield an index of funding model diversity, as reported in Chart 5.

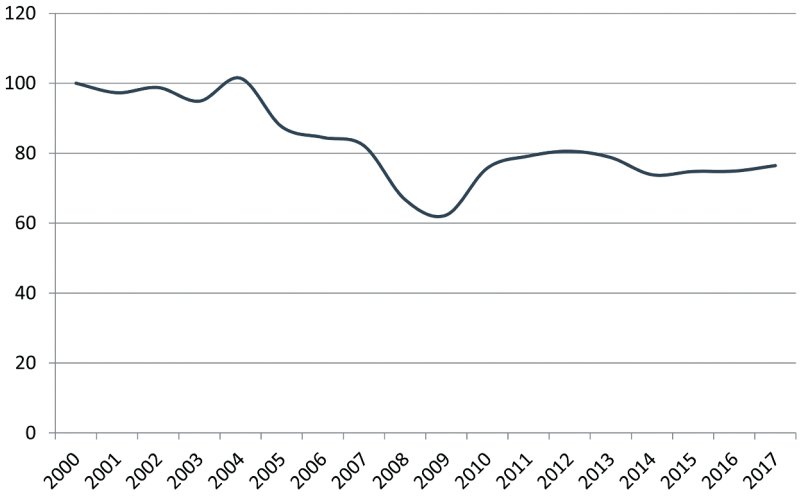

Chart 5. Resilience index.

3.5. Geographic spread and the concentration of financial services

Britain has long had a regional inequality problem, with wealth and income being skewed towards the South East. The fact that the financial services sector is itself not very regionally dispersed, but is rather concentrated in the 'City of London' exacerbates Britain's regional imbalance. Arguably, the concentration of banks within 'the City' not only represents jobs and wealth being based in that region rather than others, but also creates an additional problem by focusing attention on the financial activity of the City of London as an entity in itself, removed from its functions of providing financial services to consumers and businesses across the country, whereas if the strategic decision-making headquarters of banks were more regionally dispersed, as is the case in most other countries, there might be more awareness of the needs and aspirations of the companies that produce the goods and services that underpin the livelihoods and prosperity of individuals and communities across the country. Research by Tenenbaum and Waters (2011) and Alessandrini, Presbitero, and Zazzaro (2009) and (2010) has shown that distance between lenders and borrowers has an impact on the quantity and quality of finance supplied to a region/locality.

We therefore created an index for the geographical dispersion of the financial services sector by measuring the distance of the company's HQ from the City of London, as reported in Chart 6. While from 2000 to 2010 the index falls overall, it rises first. This is because the distance is weighted based on market share, so the concentration has a significant effect on the Index. For example, the Halifax/BOS merger causes the index to increase in 2001, as the Halifax business is then based in Edinburgh. The increase in market share over the period of the RBS group, also based in Edinburgh, compounds this. In 2008, the acquisition of HBOS by Lloyds brings a large portion of mortgage balances to London, causing the Index to fall substantially.

As can be seen, one of the consequences of the 2007–09 financial crisis was a fall in this index, representing a deterioration of the already weak regional dispersion of our banking sector.

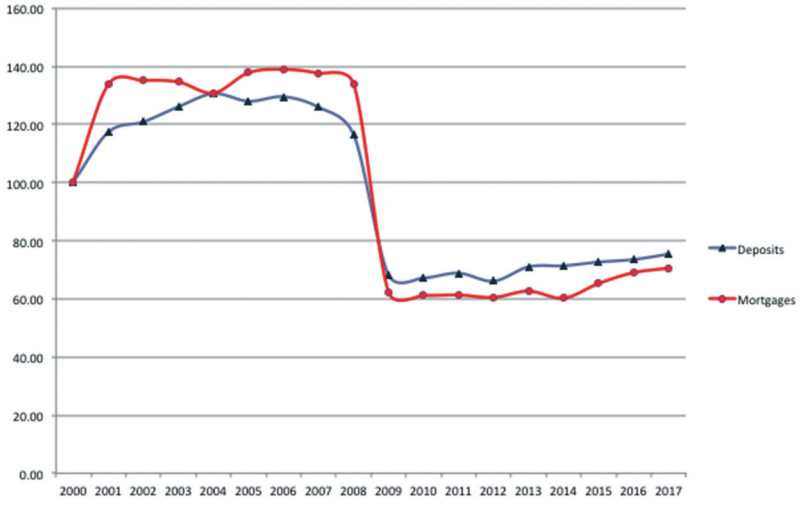

Chart 6. Geographic spread of head offices and strategic decision making.
Source: own calculations (see Section 3.3 above).

4. The diversity index (D-index) for financial services

The above analysis of corporate diversity, competition, funding model diversity, and geographic spread provides measures and indices of the various dimensions of diversity that have been analysed in recent academic and policy related debates on the financial sector. However, as our discussion has made clear these different aspects interact, resulting in combined effects. For example, the decline in corporate diversity in the mortgage market was associated with higher mortgage-deposit rate spreads as the commercial banks became more dominant. Similarly, competition from new entrants based on new, wholesale funding models led to upward drift in the funding gap for existing lenders, which in turn led to a shake-out of firms. In order to capture these distinct and interactive effects we propose a composite diversity index for financial services based on a weighted average of the component indices and their sub-indices as shown in Figure 1 and Chart 7.

Chart 7 shows that the D-Index was roughly constant between 2000–06 before falling in the run up to and during the financial crisis. Since 2009 the Financial Diversity index has recovered from its all-time low in 2009, but it is still below its 2006 level. One of the main reasons for this is that ownership diversity, competitiveness, resilience and geographic diversity have not recovered to their pre- financial crisis levels, suggesting that the crisis did lasting damage to the structure and resilience of the UK financial services sector. The one area where there has been a return to pre-crisis levels is in the concentration of loan to deposit ratios where tighter regulation under Basel III may have played a part.

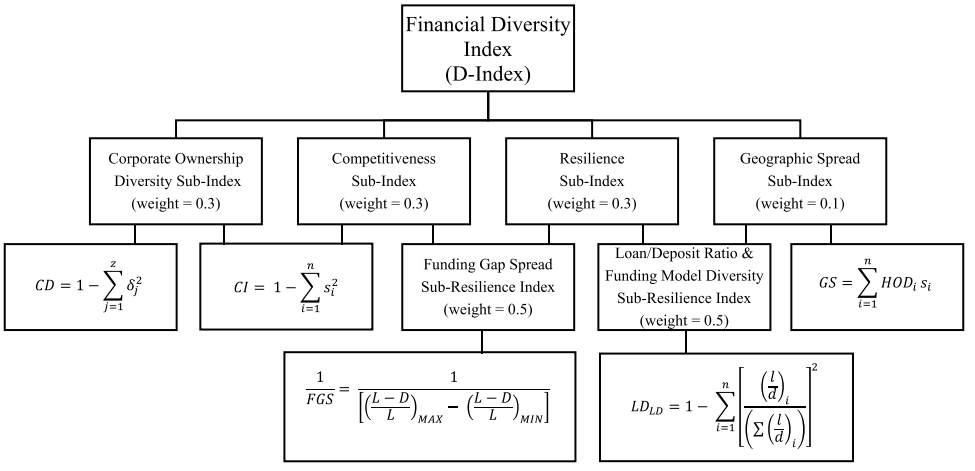

Figure 1. The D-index and its component sub-indexes.[16]

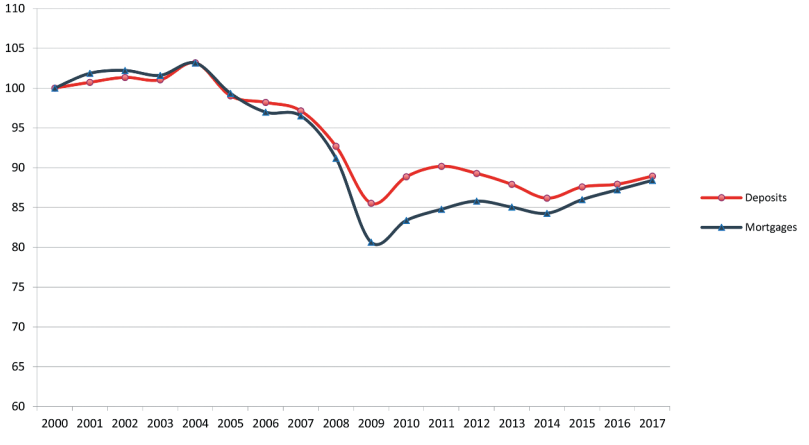

Chart 7. Diversity index for UK financial services (D-index): ownership, competitiveness, resilience & geographic spread.
Source: own calculations (see Appendix 1).

5. Using the D-index and its components

The literature on diversity and financial services (see for example, Goodhart and Wagner (2012) and Kay (2012)) shows that diversity is important for two main reasons: financial stability and consumer welfare.

Ayadi et al. (2010, 2012) and Kay (2012) argue that competition is multifaceted and depends not just on the number of firms but on behavioural diversity. Competition may be enhanced by both an increase in the number of firms in financial services, *and* by an increase in their behavioural diversity. This idea lies at the centre of models of mixed

oligopoly where the market is 'mixed' by the coexistence of different types of firms that exhibit different behaviour. Firm types are specified in terms of their objectives and it is common to assume that privately owned firms maximise profits while government owned corporations follow other objectives. For example, the post office savings bank (now NS&I) was established to encourage people to save and to provide a source of funds (deposits) for government – it does not aim to maximise shareholder value. We extend this approach to take account of mutually owned organisations – owned by their customers – which may be assumed to maximise customer welfare. Because mutually owned financial institutions do not pay dividends to outside shareholders and because they act in the interests of the customer owners we can expect deposit rates to be higher and lending rates to be lower as compared with shareholder owned banks.

This is confirmed by monthly data on mortgage rates and time deposit rates for banks and mutuals published by the Bank of England[17] as illustrated in Chart 8, 9, 10 which show the mortgage-deposit rates spreads. As expected the spread is noticeably higher for banks as compared with building societies, reflecting the fact that building societies were charging lower mortgage rates and offering higher deposit rates to their 'owner' customers. Assuming that costs are the same across banks and mutuals, and that there are no constraints on deposit raising capacity, the whole market would go to mutuals as they would price competitively and make normal returns. But with constraints on deposit raising e.g. geographic reach, switching costs, *etc*. the market remains mixed with differential pricing and profitability.

To capture the idea of enhanced competition from diversity it is useful to identify two types of competition effect: (i) a firm numbers effect; and (ii) a corporate diversity effect. Theoretically we can expect both effects to reduce the mortgage-deposit rate spread; however, it is reasonable to expect that greater competition from mutuals will have a bigger negative effect on margins than greater competition from banks, as the aim of mutuals is not to maximise profit or shareholder value, but to maximise customer-owner welfare.

In summary, we hypothesise that:

H1: *The Bank Mortgage Rate > The Mutual Mortgage Rate*

H2: *The Bank Deposit Rate < The Mutual Deposit Rate*

H3: *The Bank MR-DR Spread > The Mutual MR-DR Spread*

H4: *Corporate Diversity and the Bank MR-DR Spread are negatively related*

H5: *Market Concentration and the Bank MR-DR Spread are positively related*

Using data on interest rates for banks and building societies published by the Bank of England we calculate interest rate spreads for both types of financial institution as shown in Chart 8, 9 and 10.[18] It can be seen from the Charts that hypotheses H1-H3 are confirmed.

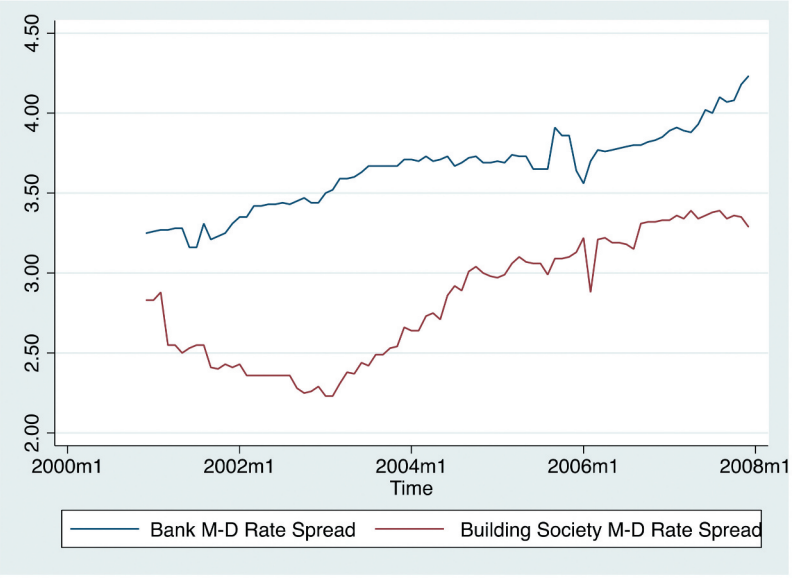

Chart 8. Mortgage-deposit rates spreads: banks and building societies.
Source: Bank of England monthly data on mortgage and time deposit rates for banks and building societies.

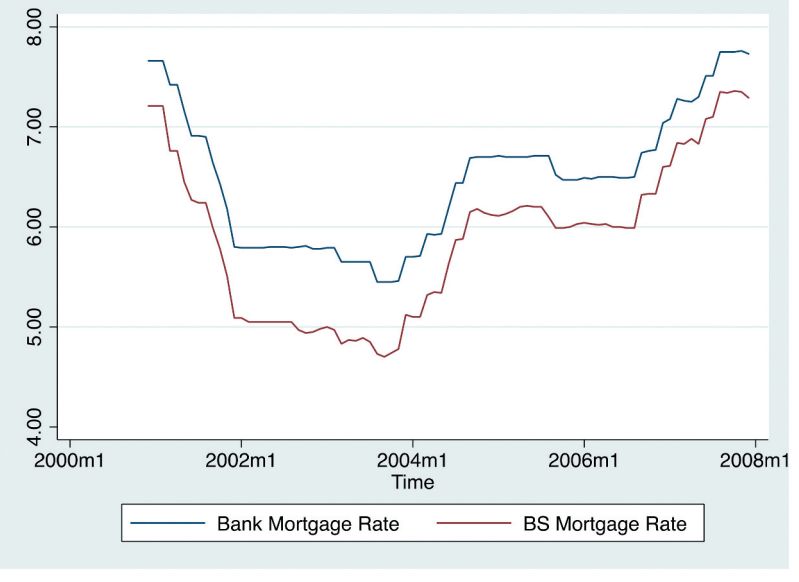

Chart 9. Bank and building society mortgage rates.
Source: Bank of England monthly data on mortgage and time deposit rates for banks and building societies.

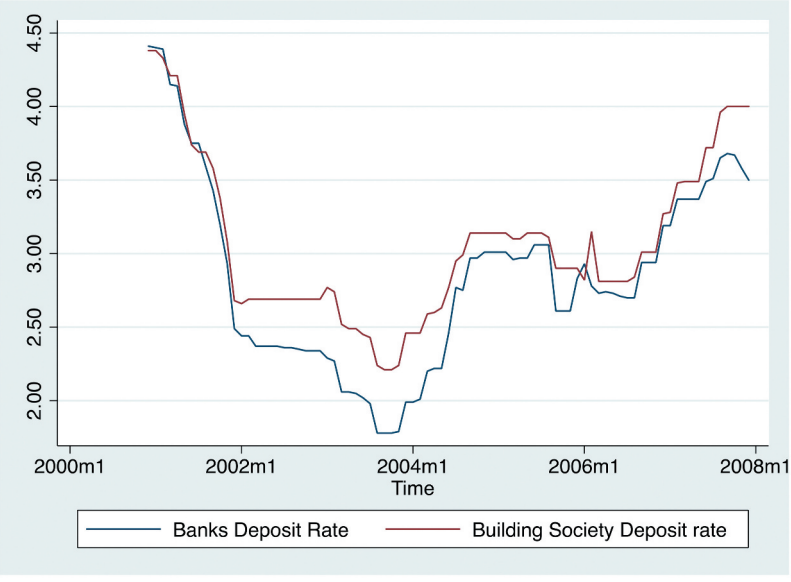

Chart 10. Bank and building society deposit rates.
Source: Bank of England monthly data on mortgage and time deposit rates for banks and building societies.

To explore hypotheses H4 and H5 we estimate the following model where the Mortgage-Deposit Rate Spread for banks (MDS) is a function of the degree of competition as captured by the Hirschmann-Herfindahl Concentration Index (HH) and the extent of corporate ownership diversity (OD), measured by our corporate ownership diversity index in the mortgage market. The general model is of the form

$$MDS_t = \beta_o + \beta_1 OD_t + \beta_2 HH_t + u_t$$

The correlation matrix of variables is shown in Table 1.

Table 1. Correlation matrix.

	MDS	HH	OD
MDS	1		
HH	0.71**	1	
OD	−0.93**	−0.63**	1

**denotes significance at the 1% level.

The model has been estimated using monthly data for the period 2000–2007, the latest year for which separate interest rate data were published by the Bank of England. The correlation between our explanatory variables, OD and HH, does not appear too high and TIF and VIF statistics confirm that multicollinearity is not a problem. However, it can be seen from Charts 1, 2 and 8 that our variables are trending over time so we conducted Augmented Dickey Fuller tests which confirmed non-stationarity of MDS, OD and HH. We also ran regressions of each variable against a time trend and saved the

residuals to test for trend stationarity. All three variables were trend stationary at the 10% level or better. In light of these results, we proceeded to estimate a cointegration model with a time trend.

Because it takes time for financial institutions to adjust rates in response to structural changes in the market, we used lagged values of the explanatory variables. Banks need more than a month to adjust their rates *and* give due notice to customers of a change in their monthly payments, hence we chose a 2 month lag. Nonlinearities in our corporate diversity variable (OD) and the Hirschman-Herfindahl index (HH) suggest the use of logs for these variables. To minimise potential problems of omitted variable bias we included a lagged dependent variable. We report OLS estimations and Newey-West estimations with robust standard errors.

The results in Table 2 show that corporate ownership diversity (OD) has a negative and significant effect on the mortgage-deposit rate spread of banks (i.e. greater competition from building societies reduces the mortgage-deposit rate spread and benefits consumers), while the HH index of market concentration is positive but not significant. The result for HH is most likely affected by one of the key features of the financial crisis, namely that in the run up to the crisis a number of small, sub-prime mortgage lenders (e.g. Lehman Brothers) rushed into the market reducing the HH index (see Chart 2 which shows the complement of the HH – the competitiveness index), but they tended to operate in the high risk, high interest rate end of the market. Hence, competition from these new entrants exerted no downward pressure on mortgage rates. Moreover, they promptly left the market after the collapse of the sub-prime market in 2008 as can be seen from Chart 2. The entry and exit of sub-prime mortgage lenders illustrates how competition in terms of firm numbers can have negative and transitory effects on consumer welfare. What matters is not just the extent of competition in terms of the number of firms in the industry and their market shares, as captured by HH, but the *type* of competition. New entrants such as Lehman Brothers and other subprime lenders operating in the high interest rate, high risk end of the market had no effect on the standard

Table 2. Results from regressions of the bank mortgage-deposit rate spread (MDS) on the degree of competition (HH) and corporate ownership diversity (OD).

	OLS Estimators		Newey-West Robust Standard Errors	
	MDS	MDS	MDS	MDS
Constant	−3.3605	−3619	−0.3605	−3619
	(−2.84)***	(−3.08) ***	(−2.77) ***	(−3.16) ***
Log BS_{t-1}	0.6834	0.6832	0.6834	0.6832
	(8.60)***	(8.72) ***	(8.57)***	(8.94) ***
Log OD_{t-2}	−0.5420	−0.5273	−0.5420	−0.5273
	(−2.26)**	(−2.99) ***	(−3.13)***	(−3.29) ***
Log HH_{t-2}	0.1977	–	0.1977	–
	(0.03)		(0.04)	
Time	0.0002	0.0002	0.0002	0.0002
	(0.57)	(1.12)	(0.67)	(1.17)
F-Statistic	404.09	545.69	383.97	516.38
Adjusted R^2	0.9516	0.9522		
Durbin Watson	1.900	1.899		
Breusch-Godfrey	0.282	0.282		
Engle-Granger	−8.600	−0.86		
Number of Obs	82	82	82	82

** and *** denote significance at the 5% and 1% levels respectively.

mortgage-deposit spread of banks. In contrast, competition from Building Societies that seek to maximise customer welfare was very effective in exerting downward pressure on banks' mortgage-deposit rate margin.

In summary, we find that corporate ownership diversity had a significant negative impact on banks' mortgage rate-deposit rate spread, confirming the notion that competition from different types of financial institutions, in this case building societies, yields better outcomes for consumers in terms of lower mortgage rates and higher savings rates. At the same time, greater competition in terms of firm numbers, as captured by the HH index, may not always yield improved consumer outcomes, since it depends on the type and permanency of competition.

6. Conclusion

There is widespread agreement that public policy should aim for a more corporately diverse financial services sector. It is therefore important to measure the degree of corporate diversity, both to assess the resilience of the financial services sector and to track the progress of public policy towards achieving the goal of greater diversity. It is therefore surprising that to date there has been no such measure. This paper reported the creation of such a measure, the D-index.

A commitment to achieve greater corporate diversity in the financial services sector, means achieving a rise in the D-index. The UK's 2010–15 Coalition Government made just such a commitment, but it failed to create any measure to see whether they were achieving this objective or not. We therefore created such an index, as reported here. Utilising this index, the UK's 2010–15 Coalition Government was found to have failed in their objective.

Our D-Index did show a marked decline in the run-up to and during the 2007–2009 financial crisis. Since then, the index has remained more or less flat. The UK has not created the conditions – of diversity – that were correctly identified as constituting an important component of avoiding a repeat of the financial crisis.

Historically, the UK's financial services sector has exhibited a lack of diversity in four important regards. Firstly, it has been dominated by large PLC banks, with a relatively small co-operative and mutual sector. Secondly, it has been dominated by 'too big to fail' banks. Thirdly, balance sheets have relied on borrowing short and lending long to a greater extent than in other countries. And fourthly, the sector has not been very geographically dispersed, instead being rather concentrated in the City of London.

This paper has analysed each of these four components, creating indexes for each of them – and where appropriate looking at both sides of the relevant markets – and combining them to create the diversity index, or D-index.

This D-index provides for the first time a measure of corporate diversity in the financial services sector and offers policy makers with a means of tracking progress towards promoting greater such diversity.

The policy recommendations of Haldane and May (2011) and Goodhart and Wagner (2012) require regulators to pay greater attention to diversity in the design of policy. The D-index provides the means by which such diversity can be measured, tracked and reported.

Notes

1. See for example, Michie and Llewellyn (2010), and the EU.
2. Data from the BRES database. Note that this comparison spans changes in the definition of the monetary intermediation sector, which makes inter-temporal comparisons difficult. However, the effect of changes in the classification is likely to be around half a percentage point.
3. The original version of the Diversity Index (D-Index) was published in Michie and Oughton (2013).
4. While this index is commonly referred to as the Berry Index of Diversification, it appears to have been proposed independently by Berry (1971) and McVey (1972) – see Gollop and Monahan (1991). The index is in fact identical in structure to the Gini-Simpson index discussed below and first developed by Simpson in 1949. In his book, Berry (1971) states that he has derived the index as an application of the Herfindahl index of concentration and appears to be unaware of the earlier work by Hirschman (1945) or Simpson (1949).
5. In the case of a uni-product firm the index would be equal to zero, in the case of a multi-product firm with production spread evenly over a very large number of products, the index would approach 1.
6. This index is similar to the Hirschman-Herfindahl index of concentration first introduced by Hirschman in 1945 (as an index of trade concentration across different commodities using the square root of the above formula) and subsequently developed by Herfindahl in 1950 as an index of market concentration using the above equation based on each firm's market share in the steel industry.
7. Edmonds, Jarrett, and Woodhouse (2010) provide a useful timeline of the events of the credit crisis.
8. The mutual sector was gradually increasing its share of deposits prior to the 2007–2009 international financial crisis.
9. These spreads are shown in Appendix 2, Chart 2 along with our corporate diversity index for mortgages. The data end in 2007 when the Bank of England stopped publishing separate interest rate figures for banks and building societies. The correlation coefficient between the banks' Mortgage Rate-Deposit Rate spread and our corporate diversity index for mortgages is −0.9 and is statistically significant at the 0.01% level (99% confidence interval).
10. The lower bound of the index is close to zero for competitive markets with a large number of firms with equal shares, since as the number of firms increases 5/n approaches zero.
11. Hart (1975) argued that the HH index is more sensitive than CR5 to changes in the number of firms (n); however, Davies (1979) has subsequently shown that it is less sensitive to n except at very low levels of concentration.
12. Note that the OFT calculates the HH index in terms of percentage market shares and so these thresholds become 1000 and 2000 respectively, i.e. the raw index is effectively multiplied by $100 \times 100 = 10{,}000$.
13. This measure is used by the Bank of England in its Financial Stability Reports as a measure of banking sector resilience, see Bank of England (2010), Bank of England (2012).
14. Note that small lenders without UK retail deposits (for example, Kensington and Britannic Money, who entered the top 30 mortgage lenders in 2002 and Lehman Bros, who entered in 2004) are excluded from this analysis so that Chart 3 shows the upward drift in funding models used by retail deposit taking institutions. Inclusion of the likes of Kensington *et al* would shift the maximum value to 1 from 2002 onwards. Northern Rock and Bradford and Bingley are included under UKAR in 2010 and 2011.
15. Lenders without UK deposits were excluded, as their loan to deposit ratios are undefined.

16. The Corporate Diversity Index (CD), the Competitiveness Index (CI) the Geographic Spread Index (GS) and the D-Index may be measured for the mortgage and deposit markets individually as shown in Figures 1, 2, 6 and 7 or combined by taking the average across the mortgage and deposit markets to give a composite index for the retail financial sector.
17. The Bank of England stopped publishing separate data for banks and building societies in 2007 so these are the most recent data available.
18. The data series end in December 2007 as the Bank of England ceased publication of separate interest rate data for Banks and Building Societies from January 2008 onwards.
19. O'Connor (2010) argues that the decision to change the way in which the Bank of England and the National Statistics Office classified different types of monetary and financial institutions was associated with, or prompted by three factors: the relative importance of Building Societies and banks; disclosure issues; and the change in the BSA's data coverage.

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Appendix 1: Data Sources and Methods

Data Used to Construct our D-Index

The data for the construction of our D-Index were gathered variously from the Bank of England, the British Bankers' Association's *Abstract of Banking Statistics*, and the Council of Mortgage Lenders, as well as from annual company accounts of banks and building societies, with additional data purchased as necessary from 'The Data' – a company specialised in the provision of financial services data to specialist organisations, such as the Council of Mortgage Lenders. Data on loans and advances to customers, loans secured on residential property, UK and non-UK retail deposits and other variables were collected either for the entire market or for the top 30 or so banks, building societies, mutuals and government owned financial institutions that together account for close to 100% of the mortgage and retail deposits markets in the UK. Various recalculations were required to make the series consistent, given changes over time in how they had been compiled; (for example, in January 2010 the Bank of England changed the way it reported data for different ownership types: prior to January 2010 the Bank reported data by three broad groups – Banks, Building Societies and Other Specialist Lenders – whereas post January 2010 the first two groups changed to Banks and Mutuals where the latter includes Building Societies and Mutual Banks, a change reflecting the reclassification of the Co-operative Bank to the new 'Mutuals' sector post 2010).[19]

Interest Rate Data Used in Regressions

Monthly data on interest rates for Banks and Building Socities are from the Bank of England (BoE). For each category of financial institution (banks and building societies) they are calculated by BoE as (i) the weighted average of the standard variable mortgage rate, and (ii) the weighted time deposit rate. Note that from January 2008 the Bank of England stopped publishing separate interest rate data for Banks and Building Societies. Monthly data for the HH index were not available so we used interpolation to make use of the additional information embed in the monthly data available for interest rates and the OD index.