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South African Manufacturing: The challenge of growth with jobs

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ABSTRACT

This paper evaluates South African manufacturing performance over 25 years. It reports the evolution of five basic variables: employment, mark-ups, exports, domestic sales, and investment, using an aggregated sample of firms from a reliable business database. The approach differs from other economic models by the complementary use of management perceptions in estimated equations.

The results reinforce some previous findings; for example, wage pressure tends to constrain domestic sales while the relative wage incentivizes capital investment. The exchange rate matters for exports and investment is constrained by skill shortages. Other findings add evidence to contested issues such as the importance of the interest rate level for investment and exchange rate stability for export growth.

Relationships between key variables can help to identify growth constraints and the potential for manufacturing jobs. In particular, the lack of transmission from exports to employment or to domestic sales and the response of the mark-up to investment suggest institutional failures in coordinating market activity.

1. Introduction

Many middle-income economies are characterized by premature deindustrialization and South Africa is no exception. It is now more difficult to emulate the East Asian miracle of a virtuous cycle of export-productivity-growth due to increasing competition and the technological challenges of entering global supply chains. (Rodrik 2018; Andreoni and Tregenna 2020; Zalk 2021). For South Africa, the manufacturing growth rates of output and investment have been relatively low even in comparison with middle-income ones since 1990 (Black 2021; Mondliwa et al., 2021). The manufacturing share of GDP halved from 1990 to reach about 12 % in 2011 and the story since then has been one of plateau and slow growth (Tregenna et al., 2021). Constraining factors on growth have included: uncompetitive up-stream suppliers, endemic skill shortages, and an industrial policy that has proved difficult to implement (Black and Hassan 2016). The 'mediocre performance' of the manufacturing sector has been said to be the 'clearest symptom of the lack of transformation of the South African economy' (Bhorat et al. 2014:14). Yet there is no broad consensus as to why that is so despite a large set of high-quality contributions.

In this paper I aim to complement rather than displace previous research. This approach employs business survey responses for key manufacturing variables in order to gain insight into their relationships. but without specifying a full model of the manufacturing sector which would be premature. This kind of research is exploratory, but it needs to be seen in a context where more ambitious approaches often lack traction. It is worth recalling that most macroeconomic models are hard pressed to improve on autoregressive forecasts (Hendry 2017).

The key dependent variables examined here are employment, mark-ups, exports, domestic sales and capital investment. Why these variables? First, they represent the main expenditures and income components of firms – labour and capital on the one hand and domestic and export sales on the other. The behaviour of these variables is mediated by relative prices, in particular the mark-ups on both domestic and export sales; these mark-ups can also be decomposed into price and cost elements. Second, these variables are of topical interest as judged by the attention they have received in overviews of the literature of South Africa's manufacturing performance (Bhorat et al. eds. 2014; Andreoni et al., 2021; Oqubay et al., 2021)

Section 2 gives a general overview of the challenges facing the South African manufacturing sector. Narrative accounts are given at the outset of each of the empirical Sections 4-7, following a description of the data sources and methods in Section 3. The analytic content is reported as follows: the determinants of employment (Section 4); the trend and behaviour of domestic and export mark-ups (Section 5); the behaviour of exports and domestic demand – and their relationship (Section 6); and business investment (Section 7). Concluding comments are in Section 8.

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2. South African Manufacturing in context: constraints and challenges

South Africa's labour force is badly matched by location or skill to employment demand, partly for country-specific historical reasons. Because of this, only second-best options are available that may imply trade-offs between productivity growth and employment growth.[1] An optimistic view is that manufacturing can still contribute to jobs growth in some sectors of manufacturing (Zalk 2014; Black 2021) or through indirectly linked jobs elsewhere in the economy (Tregenna, 2008). Even those who expect the share of manufacturing to continue to decline - and put most faith in services growth - have some hope that absolute manufacturing employment can rise (Lawrence 2018). However, there are major constraints on manufacturing growth especially in sectors that matter for employment. Six of the top sectors of the economy in terms of employment multipliers (direct and indirect) are in manufacturing but apart from food, all are static or in decline. Even where employment growth is marginally positive it tends to be lower than output growth (Tregenna 2016; Bhorat and Rooney 2017; Bhorat et al., 2021). South Africa's share of textiles in GDP declined from 8 to 2 % over 25 years compared to Turkey where it is virtually unchanged at 17 % (Black 2021:523). There is no general consensus on policy to resolve this; several related elements may matter, and a single magic bullet is unlikely.[2] It is more fruitful to consider coherent accounts of linked constraints as discussed next.

Competition and Market Power. South African business with roots in the Apartheid period will have learned how to cooperate on pricing and supply arrangements. From the transition, trade liberalisation was relied on to contain monopoly power. The balance of evidence suggests that import penetration did reduce mark-ups in manufacturing overall.[3] But the aggregate data hides a complex and heterogeneous pattern of market power that has been analysed at industry level (Buthelezi et al., 2018; Andreoni et al., 2021) and firm level (Fedderke et al., 2018; Andreoni et al., 2021). The general conclusion is that entry barriers and market power in the upstream (intermediate) sector damages downstream manufacturing; arguably this has been exacerbated by the manner of implementation of state subsidies (Mondliwa et al., 2021; Black 2021).[4] Unlike other manufacturing sectors, the upstream industries appear to have been able to protect their margins from Chinese import competition (Torreggiani and Andreoni 2023). A respected view is that action on business competition needs to be integrated with industrial policy and macroeconomics, particularly in regard to *trade* and *capital allocation.*

Trade. Despite trade liberalisation, total export growth for south Africa was about half that of comparator countries between 1994 and 2019 (Black 2021, Table 24.1), while since 2008, export volume has been lower than even the weak GDP growth. Nor is the growth in exports broad-based with the top 5 % of export firms accounting for 90 % of exports. Low rates of entry and narrowing product ranges for exports have been noted also in the post 2008 period (Edwards 2021). So inadequate competition hampers trade but trade is necessary to induce competition. For some, the answer is to double down on openness and focus on increasing productivity. An uncompromising version of this is that trade integration needs to be ramped up to ensure higher returns and to resolve the situation whereby "South African firms do not have a problem with financing investment - they just don't want to finance it at home" (Viegi and Dadam 2018:24). A contrasting argument is that trade needs to be part of a supportive state-led industry-wide upgrade, focused on backward linkages and possibly aided by a greater recourse to exchange rate policy.[5] The literature is conflicted on the extent of transmission of gains from South African exports to the wider economy (Feddersen et al., 2017; Mishra 2019).

Capital allocation, finance and macro-policy. Critical multi-country studies have shown that excessive financialisation may damage economic growth by discouraging productive investment (Cecchetti and Kharroubi 2015; Stiglitz and Guzman 2021). In South Africa, trade liberalisation has gone hand in hand with increased capital flows that tend to be pro-cyclical and short-term (Nissanke 2019). Manufacturing does not gain much from this as inward investment increasingly favours commercial services and finance. Investors, especially foreign ones subject to asymmetric information, are seeking portfolio investment in liquid stock with fast, regular pay-out (Andreoni et al., 2021). Manufacturing does not have much weight in the South African main stock market (JSE) and the manufacturing companies that are listed have lower return on assets and equity than other sectors such as services and mining (Bosiu et al., 2017). In theory financial markets could correct such underperformance by reallocation of capital across firms. However, the risky business of transforming an ailing manufacturing sector is unlikely to attract stable streams of foreign or domestic investment, unless a policy framework makes this a priority. Manufacturing's poor performance thus requires sectoral rather than individual firm solutions to capital allocation and productivity. This does not mean that stable inward investment is unwelcome though it has been argued too that more can be done to mobilise domestic finance (Nissanke 2019). But the prior issue is the restructuring and coordination of a manufacturing revival that makes investors willing to invest for a reasonable return and that convinces global suppliers to increase backward linkage in supply chains. Relying on foreign portfolio capital requires nominal stabilisation policies that tend to displace pro-active fiscal and exchange rate policy.

Choices remain over whether the emphasis is put on market solutions, or on active and coordinated industrial policy, to create a transmission belt from high productivity-growth sectors to the general economy. I explore these questions insofar as the data allows by studying the determinants and effects of mark-ups in SA manufacturing, both domestic and export, and by investigating the link from exports and investment to domestic output and employment.

3. Data sources and econometric specification

The data are mostly drawn from the manufacturing business tendency survey run by the South African Bureau of Economic Research (BER) and complemented with official data e.g., from the South African Reserve Bank (SARB). South Africa was one of the earliest countries to

[1] A pessimistic note is struck in Hausmann and Klinger (2008:628) "Virtually all of the labour intensive export activities are very far away from South Africa's current structure of production, meaning they would be difficult to move to … and would be a dead-end in terms of igniting continued structural transformation."

[2] The literature records a long list of potential constraints including: the absence of a broad-based and small-firm export sector; insufficiently forceful exchange rate policy; trade liberalisation insufficiently targeted; constrained investment due to macro or policy uncertainty and/or cost of capital; a high cost of borrowing due to a lack of national savings or national dissaving through foreign repatriation of funds; a low appetite for inward manufacturing FDI; a failure of fiscal policy to play a robust countercyclical role; poor quality physical and educational infrastructure; state capture in public provision; excessive focus on supporting large capital-intensive business; monopoly power; lack of regional wage bargaining; excessive premium for managerial labour; a timid industrial policy uncoordinated with macroeconomic goals.

[3] For evidence on different aspects of the debate see Aghion (2008,2013), Zalk (2014), du Plessis et al (2015), Driver (2019).

[4] Rents in upstream sectors are shared with managerial labour and professional labour which commands an unusual high premium in South Africa, fueled by high demand (Bhorat and Rooney 2017) and competitively raising costs in downstream sectors. However, the manual real wage in manufacturing generally, while relatively high (Gelb et al 2013), does not appear to be a general source of national wage-push (Venter and Botes 2016).

[5] See in regard to these debates: Rodrik (2018); Andreoni et al (eds 2021); Zalk (2021); Edwards (2021).

Table 1
Variables and sources.

Concept	Constructed as:	Acronym[1]	Source: row(s) and [reference code] in BER database or other source shown in bold
Panel A. Variables obtained directly from the BER database. Shown with a D prefix if differenced.			
Growth in production	Survey balance statistic	VOLy	R5[MF02PV00]
Growth in domestic sales	Survey balance statistic	VOLd	R3[MF01SD00]
	Survey balance statistic	ORDd	R6[MF030D00]
Growth in exports	Survey balance statistic	VOLx	R4[MF01SA00]
	Survey balance statistic	ORDx	R7[MF03OA00]
Growth in employment	Survey balance statistic	EMPN	R10[MF06NW00]
Growth in fixed investment	Survey balance statistic	FIXINV	R12[MF08F100]
Growth in avg. total cost per unit	Survey balance statistic	UTC	R13[MF09IP00]
Growth in avg. labour cost Per unit	Survey balance statistic	ULC	R14[MF09LP00]
Growth in domestic price per unit produced	Survey balance statistic	Pd	R16[MF09SP00]
Growth in export price per unit produced	Survey balance statistic	Px	R17[MF09SA00]
Percentage rating output below capacity	Survey % measure	EXCESS_K	R21[MF12L000]
Constraint from skilled labour	Survey % constrained:	SKILL_H	R23[MF14SS00]
Constraint from unskilled labour	Survey % constrained	SKILL_L	R25[MF14SU00]
Constraint from short-term interest rate	Survey % constrained (differenced due to non-stationarity)	**D**IRATE	IRATE= R27[MF14LS00]
Cyclical demand constraint	Survey % constrained	CYCLE_D	R28[MF14ID00]
General political climate a constraint	Survey % constrained (differenced due to non-stationarity)	**D**POL	POL= R29[MF14PC00]
Efficiency investment plans one year ahead	Expected real investment in machinery and equipment in a year's time (balance)	INVPLAN	R32[MF15RI00]
Directional business conditions one year ahead	Survey balance statistic. This is distinct from the levels confidence indicator	BCON	R33[MF15BC00]
Panel B: variables obtained by transformation (other than differencing) of the BER data			
GARCH volatility measure	Conditional variance measure for BCON	GARCH_BC	**Eviews, estimated**
Real unit wage cost	Derived	RULC	R14-R16
Growth in the price–cost margin (domestic or exports)	Domestic (Export) rate of change in mark-up obtained as differential between rate of change of domestic (export) prices and rate of change in unit cost where rates of change are proxied by balance statistics	Domestic =MUd Export =MUx	R16-R13 R17-R13
Differential skill constraint	% constrained (high skill) minus % constrained (low skill)	SKILL_H-L	R23-R25
Panel C: variables obtained from or derived from external sources			
Extent to which the nominal exchange rate is overvalued or undervalued with respect to purchasing price parity.[3]	Fourth difference in the real effective exchange rate where a higher value denotes a stronger real value for the rand.	D4REER	**South African Reserve Bank. Derived from kbp5392q**
garch volatility for reer	conditional variance egarch term for d4reer	EGARCH_R	**Eviews, estimated**
labour productivity growth in manufacturing	first difference in the index of manufacturing labour productivity	DYPW	**south african reserve bank derived from kbp7079l**
World demand	OECD total GDP growth (expenditure) at constant prices	OECD_tot	**FRED database from OECD national accounts OECDNAEXKP01GPSAQ**

Notes: [1] Series indicated to be non-stationary in *Eviews* tests are first differenced and begin with **D**.
[2] Non-BER sources in bold.
[3]Positive values imply appreciation.

initiate a business tendency (in 1954) and its accuracy has improved with harmonized standardized practices formulated in conjunction with the OECD, EU and the Centre for International Research on Economic Tendency Surveys. The BER quarterly survey provides qualitative series for manufacturing (ISIC code D) on investment intentions, business climate indicators, and perceived business constraints. On average, there are about 1000 manufacturing units included in the survey which uses a panel based on deliberate sampling, membership of which is rotated every 2–3 years. The response rate has not varied much over the years and stood at 36 % in 2014. The responses are aggregated using

Table 2
Exploratory VAR analysis.

Sample: 6/01/1992 6/01/2015
Included observations: 90
Chi-squared test statistics for lag exclusion:
Numbers in [] are p-values

	EMPN	Pd	Px	VOLd	VOLx	INVPLAN	Joint
Lag 1	75.74627	31.34283	35.09326	75.59097	59.32757	52.37006	191.9124
	[2.70e-14]	[2.18e-05]	[4.13e-06]	[2.90e-14]	[6.16e-11]	[1.57e-09]	[0.000000]
Lag 2	10.36133	3.466153	4.245244	12.46970	6.604481	10.17874	45.31419
	[0.110237]	[0.748467]	[0.643527]	[0.052274]	[0.358977]	[0.117324]	[0.137359]
Lag 3	4.239088	5.669408	6.415830	4.999911	6.148145	4.746687	36.74689
	[0.644357]	[0.461222]	[0.378254]	[0.543824]	[0.406801]	[0.576688]	[0.434096]
df	6	6	6	6	6	6	36

sectoral and size weightings.[6] New survey questions were added in 1992.Q2 and that is the start date of the series used in this paper. This seems acceptable as the economy had already embarked on the process of liberalization before the formal transition (Jenkins 2008).

Business survey data are sometimes preferred because they are more timely (or published with higher frequency) than official statistics. But they also provide a way of linking variation in economic variables to business sentiment. For example, the BER reported demand constraint is a useful measure of cyclical variation for manufacturing, which corresponds exactly in coverage to the other series in the sample. Similar series include business conditions sentiment or indicators of skill shortages and other constraints. Not only do these sentiment variables add value to exploratory analysis but they may have an advantage over realized data in that the lags between stimulus and sentiment tend to be shorter than those between stimulus and activity (which include gestation lags).

The survey database records executives' estimates of directional activity (e.g., pricing, investment, output, exports). The respondents indicate if a particular activity is 'up', 'the same', or 'down', where the reference period for most questions is the current quarter compared with the same quarter one year ago. For example, one question on the survey form asks:

'Compared with the same quarter a year ago [is?] fixed investment: up/the same/down [estimated for the current quarter]'

These replies are aggregated by the BER into net balance statistics (percentage 'up' less percentage 'down') using 'number of factory workers' as weights. These survey data balance statistics correlate, under some restrictions, to a rate of change over the interval to which the survey question refers—in the current case, a four-quarter change (Pesaran 1984).[7] Because of this, the terms 'balance' and 'growth rate' will be used interchangeably for these variables. The constraint questions are aggregated to give a percentage constraint e.g., 'the % rating insufficient demand a constraint'.

The reliability of such business survey forecasts has been examined for several countries (Claveria et al., 2007; Tsuchiya 2013). A research study - that had access to the microdata underlying the UK survey balance statistics - concluded that they provide 'valid indicators of the business environment' (Lui et al., 2011: 346). For the South African BER survey, Driver and Meade (2019) confirm predictive value for the capital investment responses.

Table 1 presents selected variables from the BER and SARB datasets, using transformations of the underlying data as necessary, and indicating acronyms used in the results tables. Some external data are also employed.

3.1. Econometric specification and estimation methods

The approach adopted here is an autoregressive framework with explanatory variables lagged by at least 1 to lessen endogeneity concerns. For the rare survey variable where non-stationarity cannot be rejected, e.g., percentage rating short-term interest rates to be a constraint, I use the first difference or other transformation where that is stationary. The specifications used are broadly those familiar from standard stylized facts in macroeconomics. I do not attempt either to derive them from micro-foundations or to impose an equilibrium condition (Stiglitz and Guzman 2021).

Initial exploratory vector VAR analysis was carried out on a set of main survey variables to judge the appropriate lag length. The variables EMPN (employment), VOLd (domestic sales volume), VOLx (export sales volume) and INVPLAN (investment plans) were entered In the VAR along with the two output price indicators Pd (domestic) and Px (exports). Table 2 shows that only a single lag is required for this set. The price variables, however, are only one part of the mark up. The inclusion of ULC (unit labour cost) indicates the need for up to three lags.

Estimation is carried out by OLS, or TSLS, using *Eviews 9*. Diagnostics are reported for each equation. However, since heteroscedasticity seems generally absent from the results, the test would only be reported if the critical 5 % value were exceeded. Systems estimation with weighted least squares, gives almost identical results to single equation estimation, as reported in Appendix 1.

The general specification for the variables estimated by OLS is:

$$y_t = \beta_0 + \alpha trend + \sum_{i=1}^{2} \beta_i y_{t-i} + \sum_{j=1}^{N} \sum_{k=1}^{3} \gamma_{j,k} x_{j,t-k} + \varepsilon_t$$

where y is a generic term for the five dependent variables introduced in the text and indexed by time t; x_j is a regressor drawn for a list of N variables specific to the chosen dependent variable as indicated in the text; ε is an error term. Up to two lags on the dependent variables are used. Up to 3 lags on the independent variables are used. Any missing error correction terms are subsumed in the constant, trend, or in the equation residual, which will be monitored as part of the diagnostic testing. Given that the variables correlate with growth rates, if a trend is included, a positive value indicates acceleration.

Sections 3 to 6 each contain a narrative account, a specification list, tables of estimation output, and discussion of the relationships for the variables: employment, mark-ups, exports, domestic demand and investment. The narratives locate the relationships in the context of the South African economy and associated economic debates. A linear specification is then shown for the relevant variable equation, with the lag structure detailed in the results tables. Plausible candidates for the regressors are all included in the lists, but the representation shown omits a constant, and lagged dependent variable, which are always included - and linear trends which are included only where significant. A bold font for variables telegraphs any significant results recorded in the tables.

4. Employment

It is often argued that South Africa faces a binding growth constraint from the lack of employment opportunities, associated with domestic demand constraints and a threat to political stability (Nissanke 2019). The employment challenge is apparent from the low output elasticity of employment - believed to be around 0.5 for South Africa. This is partly due to the inherited capital intensity of the South African economy, the

[6] The survey format is similar to that of other surveys carried out in the UK by the employers' organization (CBI), in the EU by Eurostat, and in Australia by ACCI and the Westpac Bank. The BER sampling method consists of two consecutive steps. In the first, a panel of potential responders is recruited using deliberate sampling from a list of the most senior figures at registered local units (manufacturing plants), to reflect size and sub-sector, where the sector allocation is based on the main type of product or process. In recruiting this panel, in cases where there are only a few firms to choose from, all firms may be selected (e.g. automobiles). Exhaustive sampling is also used where the sector is heterogeneous in size (e.g. beverage manufacturing); otherwise a systematic selection is made in cases with a large number of firms. More than one round of selection is made until the panel reaches a satisfactory size. The panel size for manufacturing was 889 in 2000; 1129 in 2008; and 927 in 2014. Historical detail on the BER survey is contained in: http://stats.oecd.org/mei/default.asp?lang=e&subject=6&country=ZAF. Detailed discussion is given in Kershoff (2010, 2018).

[7] The balance statistic assumes constant and symmetric transformation of the qualitative series. Alternative approaches to converting the qualitative indicators to quantitative growth rates have been studied in the literature. The Carlson-Parkin probability approach introduces a threshold interval for the interpretation of "same". The Anderson-Pesaran modification allows for asymmetry in responses between up and down; there have also been arguments that the responses should be adjusted for the cycle. Nevertheless, these modifications all require additional assumptions. The basic balance statistic is often used in quantitative work and has been found to perform adequately in tracking observed data such as output growth. For details of these transformations see: Driver and Urga (2004).

reduction in share of many labour-intensive sectors, the required processes for firms integrated in value chains, slow growth of the informal sector, and weak transfer from the informal to the formal sector. It is often suggested that manufacturing jobs cannot grow relatively due to a combination of low world income elasticity and low-price elasticity for manufacturing. Others however point to potential growth in light industrial sectors or high growth manufacturing sectors (Black and Hassan 2014) and to multiplier effects (Tregenna 2008; World Bank Group 2017).[8]

The employment equation is specified for the number of workers (EMPN) and is based on theoretical considerations for a trading economy (Greenaway et al., 1999; Jenkins 2008) suggesting the inclusion of real output, real labour costs, and relative prices as well as composition effects due e.g., to investment or exports. This is represented as:

EMPN = F1[**production (VOLy,+) domestic orders ORDd+), unit labour cost (ULC-), investment plans (INVPLAN+)**, export sales (VOLx+), exchange rate (D4REER-)][9]

In Table 3, the domestic orders coefficient is significantly positive for employment, with negative significance found for production volume (VOLy). This is consistent with a positive influence of domestic orders in combination with a positive *differential* effect from domestic demand in relation to exports. There is no significance for either export volume or export orders and indeed the sign is generally negative.[10] There is no significance either for an exchange rate effect, nor for fixed investment, though Investment plans are highly significant. In relation to unit labour costs, the main significance is registered at the first and third lags. Wald tests fail to reject equal and opposite signs for these coefficients so that no long run wage effect is observed using OLS estimation.

There may be some concern that even the lagged unit cost variables are endogenous with respect to employment. To test for that, TSLS estimation is reported in columns (iii) and (iv) instrumenting the two ULC terms by the first and third lag on unit total cost (UTC), along with the first lag of the Reserve Bank variable for productivity growth (DYPW). Column (iii) runs the same specification as (ii) with these instruments. The pattern of results is similar to the OLS case. However, the sum of the two ULC terms is now negative ($p = 0.057$) as confirmed by a Wald test.[11]

The remaining significant variable is INVPLAN, the year-ahead indicator of future investment. The fact that this is significant, whereas the current investment variable FIXINV is not, may reflect a confidence effect or may be due to machine goods produced in advance of anticipated domestic investment.

Table 3
Dependent variable: employment in number of workers; survey balances for employment in numbers (EMPN): Sample 1992Q2–2015Q2.

	(i)OLS EMPN	(ii)OLS EMPN	(iii)TSLS EMPN	(iv) TSLS EMPN
LDV	0.33***	0.33**	0.36**	0.41***
ORDd(−1)	0.20**	0.39**	0.34*	
ORDd(−1)-VOLy(−1)				0.30*
VOLy(−1)	–	−0.22†	−0.27*	
ULC(−1)	0.26***	0.28***	0.38**	0.40**
ULC(−3)	−0.33***	−0.35***	−0.64***	−0.70***
INVPLAN(−1)	0.32***	0.33***	0.40***	0.43***
Constant	−24.58***	−22.17**	−15.19†	−11.88†
TREND	0.18***	0.16**	0.21***	0.21**
R Squared	0.819	0.827	0.806	0.796
Breusch-Godfrey LM(4) F-Test: (prob)	0.17	0.27	0.16	0.18
AIC	7.176	7.156	–	–
RESET_LM (prob)	0.68	0.47	0.95	0.88
QA_MAX LR F (prob)	0.16	0.22	–	–
Sargan J-Statistic (prob)	–	–	0.23	0.20
Cragg-Donald F_Stat	–	–	10.502	13.724
Endogeneity test: Diff in J-Stats (prob)	–	–	0.137	0.079
Sum ULC=0 Wald (prob)	0.53	0.52	0.128	0.046

Notes: Variables are balance statistics unless otherwise noted. EMPN = number employed; LDV= lagged dependent variable; VOLd= domestic sales volume; Voly=production volume; INVPLAN = planned year-ahead efficiency investment. The Eviews OLS diagnostics include a Ramsey RESET test and a Quandt-Andrews breakpoint test. Additional instruments used for the ULC terms are UTC(−1), UTC(−3), DLYPN (−1). TSLS diagnostics include the Sargan test for overidentifying restrictions; the Cragg-Donald test for weak instruments; the Durbin-Wu-Hausman test for endogeneity.
† $p<0.10$, * $p<0.05$, ** $p<0.01$, *** $p<0.001$.
Diagnostics: The diagnostics are all acceptable. See text for a discussion of the endogeneity testing and details of instruments for column (iii).

The main take-away from these results for employment is the importance of domestic demand. Unit labour cost is also negative for employment, once endogeneity is accounted for. The lack of significance for exports sales and the exchange rate is remarkable and is reflected in a similar finding for domestic output in Section 6

5. Mark-ups and competition

There is an ongoing controversy over the comparative level of manufacturing profitability in South Africa and whether it exceeds what is normal elsewhere (Zalk 2014; Black et al. 2016). The answer is important for the debate as to whether increased competition in the goods market is sufficient to incentivize firms to take expansionary risks or engage in innovation. Aghion et al. (2008) argued that '[there] is no robust evidence of a declining trend in the level of the mark-up' [for 1970 to 2004] and supported further trade liberalization to achieve this.[12] Certainly, this argument was highly influential and had an impact on macroeconomic policy; for example, a Treasury policy discussion highlighted 'significant mark-up' as an underlying constraint on growth potential (Faulkner and Loewald 2008:19). For manufacturing, newer

[8] Findings on the potential for labour subsidies are mixed, Burns (2016) sees potential for a third of a million jobs in manufacturing ; others find only limited success for youth tax incentives, suggesting a more important role for investment and vocational education (Mlatsheni 2021)

[9] The domestic *orders* variable seems preferable to sales so as to minimize endogeneity concerns. Unit labour cost may have a positive wage-led effect on domestic demand in the short run but would expect to be negative in the longer term. The choice between the two indicators of investment (defined in Table 1) is AIC determined and favors INVPLAN over FIXINV.

[10] A negative sign for exports may represent increased capital intensity of production as a response to greater export orientation or learning effects (Jenkins 2008).

[11] Endogeneity is supported with a p-value of 0.05. The Sargan-Hansen J-test for independence of the instruments is not rejected. The Cragg-Donald (weak instrument) test F -value of 9.21 exceeds the Stock-Yogo critical value (size) at 15 %. In column (iv) the domestic orders growth is entered as a deviation from the production volume growth as the data accepts this restriction. Using the same instrument set for the ULC variables, the pattern of results is similar to column (iii) and again the sum of the ULC terms is significantly negative (p = 0.046). The relative growth of domestic orders to production volume is now significant. Endogeneity is confirmed at the 10 % level. The Sargan test is not rejected and the Cragg-Donald test F-value of 13.72 now exceeds the Stock-Yogo critical value (size) at 10 %.

[12] Aghion et al (2008) find a negative sign of lagged price–cost margin (Lerner index) on labour productivity growth at both industry and aggregate levels up to the year 2000. The theoretical effect is non-linear and attenuated at lower levels of competitive pressure. The non-linearity is explained by a greater innovation incentive in response to competition for firms at the technological frontier, but this may appear incongruous for much of the manufacturing sector in South Africa where the distance from the frontier is large and in many cases has increased since the 1990s (Aghion et al 2013). From the estimates in Aghion et al (2008), it appears that the competition effect changes sign at a mark-up less than 3 times the mean so that very highly protected sectors would not experience a productivity boost.

evidence shows that the average mark-up *falling* after the transition, but the benefits were muted by many firms lacking the financial or other resources to adapt to a more competitive environment. (Rodrik 2008; Zalk 2014).

The survey data permit the construction of two mark-up indices for manufacturing, one for the domestic mark-up (MUd) and one for exports (MUx). These are obtained, as shown in Table 1, by subtracting the growth rate for average cost of production from the respective growth rates for both domestic prices and export prices. The two mark-ups diverged little in the 1990s, even as tariffs were sharply reduced. However, there was a noticeable divergence between the series after the real exchange rate appreciated in the early 2000s when MUx decreased relative to MUd.

It has been argued that the domestic mark-up behaviour differs by type of firm. A common perception is that upstream industries are differentiated from others by being more insulated from trade competition (Chabane et al., 2006; Jenkins 2008; Black and Hassan 2015). While it is hard to confirm that with the available data, it is possible for a limited period to disaggregate the manufacturing data into consumer, intermediate and capital goods using the NACE-based classification adopted by the BER. These disaggregated data are only available for the years 2001–2010 but this gives more than a full cycle of observations. Fig. 1 shows a Hodrick-Prescott trend of the BER domestic mark-up variable for the three categories from which it is evident that, while there is common downward direction at the beginning of the period, the intermediate sector is distinct in maintaining mark-ups stable as the upturn is maintained when new entrants would be expected to emerge. Fig. 2 underscores this point by showing the patterns of spare capacity (EXCESS_K) over the same period, with the intermediate sector being the only one to continually increase excess capacity. A list of the industries classified in each category is given in Table A3.

Mark-ups may be expected to vary pro-cyclically with sales volumes. Investment is entered to capture any technical or competition effect. A real depreciation is expected to increase the export mark-up depending on the firm's strategic decision to expand volume or margins. D4REER is also entered in the MUd equation given that it affects the price of imports. This suggests the specification:

MUd = F2A [**domestic sales (VOLd**+), export sales (VOLx+), exchange rate (D4REER+), **investment (FIXINV-/**+)**]**

MUx= F2B [domestic sales (VOLd+), **export sales (VOLx**+**), exchange rate (D4REER-**), investment (FIXINV)-/+]

The negative trends noted in Table 4 show that for aggregate manufacturing, both the domestic and exports mark-ups have been squeezed over much of the sample period.[13] For MUd, domestic sales volume is significant (cols I to iv). Export volume is also positively signed but only significant at 10 % in any specification and is omitted in the preferred (lowest AIC) specification in column (iv) due to insignificance. The real exchange rate variable had a p-value > 0.50 in all specifications and is not reported further.[14]

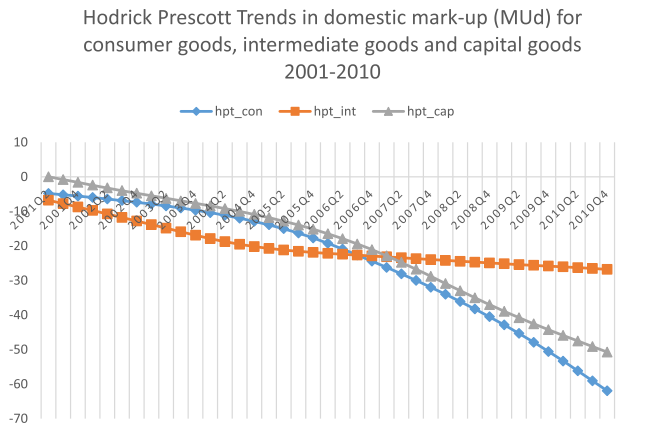

Fig. 1. Hodrick Prescott Trends in domestic mark-up (MUd) for consumer goods, intermediate goods and capital goods 2001–2010.

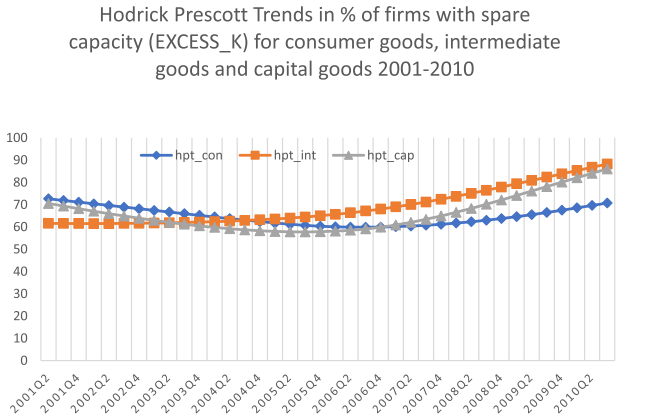

Fig. 2. Hodrick Prescott Trends in % of firms with spare capacity (EXCESS_K) for consumer goods, intermediate goods and capital goods 2001–2010.

Table 4 also shows that the domestic mark-up is not reduced by capital investment; indeed it increases with investment acceleration. This requires some interpretation because the economic theory of mark-ups tends to be ambiguous (Berry et al., 2019). In the South African context where market power is an issue, the overall effect will depend on what happens not just to marginal cost but also to competition. Efficiency investment should reduce marginal cost. Competition may be increased by new entry and expansionary investment if that is the way in which capital is deployed. On the other hand, capital deepening can reinforce the dominance of large producers, reduce the number of producers and elevate existing barriers to entry. The best outcome for the economy would either be (i) mark-ups falling in response to the competitive effect of investment; (ii) mark-ups remaining stable or falling as efficiency investment reduced marginal cost; or (iii) mark-ups rising temporarily and the surplus profit used for product differentiation and quality improvements leading to a virtuous cycle of growth. Outcome (iii) is compatible with the results obtained in Table 4 for Mud. But an additional implication of (iii) is that output would be expected to increase with the mark-up. It will be shown in Section 6 that there is no evidence for this.

[13] Both MUd and Mux - balance statistics that correlate with growth rates - show negative trends at least until around the time of the financial crash, though for MUd, the positive constant offsets the trend effect up to about 1997, possibly due to survivor (averaging) effects as weaker firms with lower mark-ups are eliminated by import competition. The fit and stability of both mark-up equations is improved by a dummy and break in trend from the quarter indicated by the (failed) QA structural stability tests. Although the timing of the breaks is slightly different, we present both results with a break for 2010Q3 as this is supported by the AIC. Results are given in columns (iv) and (vii). The interpretation of the combined trend, dummy, and interaction is a sharp downward step in the mark-up variable in late 2010 followed by a gradual but fairly complete recovery by the end of the data period. Very similar results are obtained from split samples obtained using the *Eviews* "Least Squares Estimation with breaks" where a single break is indicated" for the same quarters identified by the QA test.

[14] To further check the exchange rate influence, I examined the Granger causality of MUd and MUx with respect to 4-quarter change in the REER from which it is clear that only MUx is affected by the REER. One interpretation of the unresponsiveness of the aggregate MUd to the REER is that import costs of intermediates can offset price pressures to keep margins stable.

Table 4
Dependent variable: balance of survey indicators for the two mark-ups MUd (domestic) and MUx (exports): Sample 1992Q2–2015Q2. OLS estimation.

	(i) MUd	(ii) MUd	(iii) MUd	(iv) MUd	(v) MUx	(vi) MUx	(vii) MUx
LDV	0.24*	0.25*	0.18†	−0.04	0.50***	0.37***	0.24†
VOLd(−1)	0.16**	0.13*	0.10†	0.22***			
VOLx (−1)			0.14†			0.16†	0.09
D4REER(−1)					−0.48**	−0.44**	−0.46**
FIXINV(−1)-FIXINV(−2)		0.29*	0.26*	0.27*			
Constant	9.21*	10.10**	9.49**	17.80***	−2.04	−4.57	2.16
TREND	−0.38***	−0.39***	−0.38***	−0.63***	−0.30***	−0.32***	−0.58***
DUM2010Q3				−247.6***			−146.42*
TREND* DUM2010Q3				2.75***			1.71**
R_squared	0.564	0.593	0.61	0.694	0.655	0.667	0.698
Breusch-Godfrey LM(2) F-Test: (prob)	0.92	0.90	0.80	0.90	0.81	0.88	0.95
AIC	8.075	8.039	8.024	7.800	8.187	8.174	8.121
RESET_LR (prob)	0.26	0.28	0.88	0.99	0.56	0.60	0.91
QA_MAX LR F (prob)	0.0003 (Q3.2010)	0.0001 (Q3 2010)	0.001 (Q3 2010)	NA	0.02 (Q4.2011)	0.11	NA

Notes: Variables are balance statistics unless otherwise noted. MUd = mark-up for domestic sales; MUx = mark-up for exports; LDV= lagged dependent variable; VOLd = domestic sales volume; VOLx = export sales volume; INVPLAN= machinery and equipment investment; D4REER= four-quarter change in the REER; FIXINV = total investment. DUM2010Q3 = step dummy (=1 from 2010Q3). The Eviews diagnostics include a Ramsey RESET test and a Quandt-Andrews breakpoint test.
† $p<0.10$, * $p<0.05$, ** $p<0.01$, *** $p<0.001$.
Diagnostics. The diagnostics are mostly acceptable. The specification passes the RESET test in all cases but there is an indication of instability from the Quandt Andrews breakpoint tests (QLR) indicating a potential serious break for the MUd equations – less so for MUx. These single breaks – the Bai-Perron test shows no evidence of multiple breaks - occur in 2010Q3 (MUd) and 2011Q4 (MUx) after the financial crash when trend in mark-ups appears to fade. In columns (iii) and (vi) when an additional step dummy from 2010Q3 is entered along with an interaction of this with the trend, both variables are highly significant and the residual graph is improved along with the AIC. The original pattern of coefficients and significance shows no substantial change in pattern, particularly for MUx . Wald test for restriction on FIXINV terms accepted at 0.05 level. See text for note on split sample results.

With respect to the export mark-up (Mux), Table 4 shows a strongly significant effect from the real effective exchange rate (cols v and vi). When there is a gain in competitiveness (the REER depreciates), the exports mark-up is increased to compensate; the opposite happens with an appreciation and there is no evidence of asymmetry.[15] These findings suggest that export firms take advantage of competitiveness partly by widening profit margins. The scaled (in terms of standard deviations) impact coefficient for D4REER is approximately −0.2, as compared with +0.15 for foreign demand and −0.10 for the uncertainty variable.

Overall, the mark-up results show some similarity and some differences between the domestic and export components. Both mark-ups are procyclical but an exchange rate effect is found only for the export mark-up. There is no tendency at the aggregate manufacturing level for a trend rise in either mark-up, although a specific analysis of the domestic mark-up for the intermediate sub-sector shows that is better placed than others to maintain excess capacity and exercise market power over a complete cycle. The domestic mark-up response to fixed investment raises questions over the transmission of productivity gains throughout the sector and is discussed further in Section 6.2.

6. Export sales and domestic sales

Here we discuss both exports and domestic sales together. Post-transition, South Africa surpassed the liberalization commitments required by the WTO Uruguay Round in expectation of increased GDP growth. Increased trade openness can reduce monopoly rents and input costs, facilitate spillover gains and increase access to global supply chains potentially resulting in simultaneous growth in home and export markets particularly if backward linkages can be encouraged (Goedhuys et al., 2014). At the same time, sectors that lack absorptive capacity may be depleted prematurely with negative income effects that fall unequally on deprived communities (Rodrik 2008; Bastos and Santos 2022).

6.1. Exports

Given the open nature of the South African economy, total demand is captured by the first and second lag on the domestic sales. As a robustness test, OECD GDP quarterly growth is also included. Unit labour costs may also affect the incentive to export. The real exchange rate (REER) can affect price-sensitive exports (Guzman et al., 2018; Demir and Razmi 2022) and it is entered in the export equation along with its volatility.

VOLx=F3[**domestic sales (VOLd**+), unit labour cost (ULC-), **exchange rate (D4REER-), D4REER volatility (EGARCH_R-), world demand (OECD_tot**+)]

Results are shown in Table 5. There is a lagged response of exports to both domestic and export sales, with the data indicating two lags for each. There is a strong effect from the real exchange rate and some weak evidence of a negative effect from exchange rate volatility, measured by an EGARCH term.[16] The inclusion of the OECD growth variable improves the AIC but makes the volatility term just insignificant. Recursive estimation shows the estimated coefficient on D4REER to be flat over the period and invariant to policy regimes.

Overall, the results for exports support a role for active exchange rate policy (Rodrik 2008; OECD 2013). The results are contrary to the South African Treasury view that 'exports have been unresponsive to exchange

[15] It may reasonably be argued that the construction of the export mark-ups is flawed given that the mix of inputs differs between domestic and exported goods with the former using more domestic products and labour inputs while exports are more import and capital intensive. To test whether this makes a substantial difference to the results I re-estimated the export mark-up up using an alternative index as the difference between the balance statistics of the export selling price and a simple average of the unit costs of labour and raw materials. The results were similar in pattern and significance to before.

[16] The volatility term was first estimated by a Garch(1,1) process for D4REER but was unstable with the sum of the α and β parameters >1. A weak effect is not surprising as previous evidence with bilateral country trade has suggested that "the impact of exchange rate volatility on trade flows is indeterminate" (Baum and Caglayan 2010:89). Mpofu (2021) reviews previous work on exchange rate volatility its measurement issues for South Africa.

Table 5
Dependent variable: balance of survey indicators for export volume VOLx: Sample 1992Q2–2015Q2. OLS estimation.

	(i)	(ii)	iii
LDV	0.47***	0.47***	0.48***
LDV(−1)	0.33**	0.34**	0.32**
Vold(−1)	0.36***	0.35***	0.28**
Vold(−2)	−0.40***	−0.41***	−0.36***
D4REER(−1)	−0.43**	−0.44**	−0.48***
EGARCH_R(−1)		−0.02†	−0.02
OECD_tot (−2)			6.46*
Constant	−1.25	1.36	−2.38
R_Squared	0.718	0.728	0.746
Breusch-Godfrey LM(2) Test: (prob)	0.33	0.56	0.39
AIC	7.986	7.973	7.928
RESET_LR (prob)	0.68	0.57	0.51
QA_LR(prob)	0.36	0.81	0.47

Notes: Variables are balance statistics unless otherwise noted. VOLx = export sales volume; LDV = lagged dependent variable; VOLd = domestic sales volume; D4REER= four-quarter change in the REER; EGARCH_*R* =EGarch for D4REER; OECD_tot = OECD total gdp growth (expenditure) at constant prices. The Eviews diagnostics include a Ramsey RESET test and a Quandt-Andrews breakpoint test.
† $p<0.10$, * $p<0.05$, ** $p<0.01$, *** $p<0.001$.
Diagnostics: All diagnostics are all acceptable.

rate depreciation' (Faulker and Loewald 2008:16). The results are also contrary – at least for manufacturing - to reports that the effectiveness of this instrument is weakening over time (Edwards 2021).

6.2. Domestic sales

Exogenous influences are captured by forward looking expectations of business conditions (BCON). Unit labour costs are included to reflect the fact that in a unionized but open economy such as South Africa, wage pressure may favour imports. Domestic demand may also depend on the real exchange rate via the effect of import prices on cost and disposable income. Exports may feature as a proxy for dynamic trade effects that may benefit the overall economy. The inclusion of the domestic mark-up is to test the argument from Section 5.3 that profits from efficiency investment contribute to output growth.

VOLd=F4[+), [**unit labour cost (ULC-)**, export sales (VOLx+), exchange rate (D4REER), **future business conditions (BCON+),** domestic mark-up (Mud)]

6.3. Analysis and results: domestic sales

Table 6 shows the results with two lags on the dependent variable. A Wald test on the sum of the two ULC coefficients rejects the null of zero at the 5 % level with the implication that increased labour cost reduces domestic sales.[17] The business conditions variable (BCON) entered in column (ii) improves the AIC.

One puzzle is that there is no apparent effect from the exchange rate and this remains the case even when the ULC terms are excluded. As noted earlier from Table 5, the exchange rate does strongly boost exports and would be expected to increase domestic income. The puzzle remains if exports are directly entered in the domestic sales equation with the finding that that, too, is insignificant. Indeed, a Granger test that shows that at any reasonable lag, VOLd causes VOLx but not the reverse. The result here calls into question the transmission of export gains to the wider economy, e.g., through technology transfer, lower prices or backward linkages. For developing countries, the effect of the exchange rate has been shown to have greatest effect for low-to-medium skill products (Caglayan and Demir 2019). Such sectors are associated with light industry, or SME firms, characteristics associated with export growth and jobs potential (Purfield and Farole 2014; Anand et al., 2016), but which do not feature strongly in South African manufacturing exports.[18]

The results may appear at variance with the detailed industry results provided in Kucera et al. (2012) for the South African economy showing the 'strong spillover effects from tradable to non-tradable sectors resulting from trade contraction' using data from the period around the global financial crisis. To resolve this discrepancy, I re-estimated the first column of Table 6 including a lag of VOLx along with its interaction with a dummy for 2008 and the first half of 2009. The interaction coefficient was just significant at 5 % indicating that for this unusual period, exports did impact domestic sales.

The mark-up variable was never close to significance in the determination of domestic output suggesting that profit induced by efficiency investment is not a contributor to output growth. Nor is fixed investment significant; planned investment although weakly significant at 10 % in the absence of the confidence indicator is out-competed by the latter on the basis of the AIC.

Overall, the most important feature of these results for domestic output is the lack of significance for exports or the exchange rate. This suggests that whatever limited success there has been in export-orientated manufacturing it has not fed back into general growth for the sector.

7. Investment

It has been argued that investment in South Africa fails to transmit gains across the economy through the channel of productivity growth. The role of market power in this process has already been discussed in Section 5. A related possibility is that there is insufficient absorptive capacity or institutional support such as industrial policy to coordinate a competitive sector (Rodrik 2008; Andreoni and Tregenna 2020).

Despite these concerns over the efficacy of investment, international panel studies appear to confirm the importance of investment for growth (Bond et al., 2010), so an understanding of its determinants is needed.

The BER survey reports year-ahead plans to carry out machinery and equipment investment (INVPLAN) and also current total investment (FIXINV), which includes expansionary outlay on structures and plant. The two series show no differential trend.

I use an accelerator specification for both series, using survey orders received, to capture the influences of both domestic and export demand.[19] A Tobin Q-model is not employed here partly because it has not been shown to consistently outperform other specifications (Rapach and Wohar 2007) and also because only a small proportion of manufacturing firms are listed in South Africa. Wage pressure is represented by the difference between unit labour cost growth and domestic selling price growth (RULC). The cyclical variable CYCLE_D which measures the extent to which output is demand constrained can be considered as an inverse measure of capacity utilization, often featured in investment models. This variable will also capture cash flow - which is impacted by the cycle in several ways such as trade credit lags - and profitability stemming from cyclical pricing power (Macallan and Parker 2008). Finally, in regard to instability, this may best be measured with

[17] There is no evidence for endogeneity of the ULC terms using the same instruments as in the employment equation in Section 3.

[18] If the export equations are repeated for capital, intermediate and consumer goods for the short period 2001-2010, the explanatory power is weaker but the p-value for the REER is approximately 0.1 in all three cases with no clear indication of a differential effect between these sub-sectors. Nevertheless the direct and indirect jobs content will probably differ.

[19] Since investment is planned well in advance and since orders may be considered exogenous, these variables are unlagged. Similar results are obtained by using the sales volumes or production, lagged once.

Table 6
Dependent variable: Survey Balance for domestic sales (VOLd); Sample 1992Q2–2015Q2. OLS estimation.

	(i) VOLd	(ii) VOLd
LDV	1.04***	0.94***
LDV(−1)	−0.27**	−0.22*
BCON(−1)		0.16*
ULC(−1)	0.40***	0.40***
ULC(−2)	−0.68***	−0.64***
Constant	16.01**	13.59*
R Squared	0.791	0.801
Breusch-Godfrey Serial Correlation LM(2) F-Test: (prob)	0.27	0.29
AIC	8.000	7.970
RESET_LM (prob)	0.41	0.28
QA_MAX LR F (prob)	0.23	0.29
Sum ULC=0 Wald (prob)	0.013	0.036

Notes: Variables are balance statistics unless otherwise noted. VOLd =domestic sales volume; VOLx= export sales volume; LDV= lagged dependent variable; MUd=mark-up on domestic sales; ULC=unit labour cost; BCON = business conditions year ahead indicator. The Eviews diagnostics include a Ramsey RESET test and a Quandt-Andrews breakpoint test.
† $p<0.10$, * $p<0.05$, ** $p<0.01$, *** $p<0.001$.
Diagnostics: the diagnostics are all acceptable.

reference to the overall business climate using the BER year-ahead business conditions variable BCON which reflects the averaged subjectively weighted components of interest for the business respondents. I use a GARCH(1,1) model of conditional variance (GARCH_BC), with the underlying variable BCON also being a potential determinant of investment. To test for the idea of complementary human capital inhibiting investment, the differential between high skill and low skill labour constraints is used (SKILL_H-L).[20] The real exchange rate (D4REER) was entered to reflect competitive conditions, or the cost of imported goods. Supplementary profitability and borrowing cost indicators include the two survey-based mark-ups (domestic and export) and the survey indicator for interest rate constraint on business. The survey measure of perceived political constraints was also entered - this has been argued to affect capital investment and growth (IBRD 2018).

INVPLAN =F6a[**domestic orders (ORDd+), export orders (ORDx+)**, exchange rate (D4REER+/-), **inverse capacity utilization (CYCLE_D-), real unit labour costs ((ULC-Pd)+), business conditions (BCON+)**, business conditions volatility(GARCH_BC-), skill constraints (SKILL_H-L-), mark-ups (MUd+, MUx+), interest rate constraint (DIRATE-), political constraints (DPOL-)]

FIXINV=F6b[**domestic orders (ORDd+), export orders (ORDx+)**, exchange rate (D4REER+/-), **inverse capacity utilization (CYCLE_D-), real unit labour costs ((ULC_Pd)+)**, business conditions (BCON+), **business conditions volatility (GARCH_BC-) skill constraints (SKILL_H-L)**), mark-ups (MUd+, MUx+), interest rate constraint (DIRATE-), political constraints (DPOL-)]

Results are shown in Table 7 for both INVPLAN and FIXINV. A set of variables which were never close to significance included the interest rate constraint, the political constraint, the mark-ups, and the real exchange rate and these are omitted.[21]

In Table 7, both the domestic and export accelerator effects are significant for both indicators of investment (FIXINV AND INVPLAN). The coefficients for the real unit labour costs are positively significant so

Table 7
Dependent variables: balance of survey indicators for capital investment FIXINV and INVPLAN: Sample 1992Q2–2015Q2. OLS estimation.

	(i) INVPLAN	(ii) FIXINV	(iii) FIXINV	(iv) FIXINV
LDV(FIXINV)		0.27**	0.22*	
LDV(INVPLAN)	0.33**			0.26**
ORDd	0.14**	0.17***	0.13**	0.10*
ORDx	0.19***	0.11*	0.12*	0.11*
CYCLE_D(−1)	−0.38**	−0.55***	−0.68***	−0.67***
RULC(−1)	0.15**	0.14*	0.17**	0.19***
BCON(−1)	0.15**			
GARCH_BC(−2)			−0.003*	−0.004**
SKILL_H-L (−1)			−0.25*	−0.24*
Constant	27.89**	38.38***	58.27***	56.29***
R_Squared	0.774	0.703	0.739	0.754
Breusch-Godfrey LM(2) F-Test: (prob)	0.41	0.64	0.70	0.53
AIC	7.167	7.117	7.044	6.987
Specification RESET_LR (prob)	0.21	0.10	0.06	0.12
Structural Change QA_LR	0.07	0.06	0.28	0.08

Notes: Variables are balance statistics unless otherwise noted. INVPLAN= machinery and equipment investment; FIXINV = total investment; LDV= lagged dependent variable; ORDd = domestic sales orders; ORDx = export sales orders; CYCLE_D = Cyclical indicator Insufficient demand is a constraint; RULC = real unit labour cost; BCONF = business confidence year ahead indicator; GARCH_BC = Garch (1,1) series for BCONF. SKILL_H-L is the differential between the constraint percentages for high and low skill. The Eviews diagnostics include a Ramsey RESET test and a Quandt-Andrews breakpoint test.
† $p<0.10$, * $p<0.05$, ** $p<0.01$, *** $p<0.001$.
Diagnostics: The diagnostics are all acceptable.

that rising relative costs incentivize labour-saving automation. The only GARCH effect (conditional variance estimated for future business conditions) was obtained for FIXINV where, in col (iii) and (iv) it is negative and significant, with a lag of two.[22] Here, the business confidence variable itself does not come close to significance and was omitted. In terms of scaled coefficients (not tabulated) the GARCH magnitude in units of standard deviation is about half that of either the domestic sales or the RULC coefficients. Col.(iv) gives the result for a modified specification of FIXINV where the LDV is replaced by a lag of INVPLAN, on the grounds that INVPLAN can be shown to Granger cause FIXINV so that the specification represents a 'realization function' of actual investment on investment plans. The results are similar to before but with an improved AIC.

Shortage of high-skill labour relative to that for low-skill labour was significantly negative for FIXINV. Increased reportage of skills shortage, along with premium wages, have coincided with a substantial increase in the share of skilled workers in most sub-sectors of manufacturing and probably indicates inelastic supply that has been argued to be unsustainable (Bhorat and Rooney 2017).

Overall, the results for investment are in line with demand-determined accelerator models, complemented by a capital-labour substitution effect from relative wages and some evidence of other influences such as uncertainty and skill constraint.

8. Discussion and concluding comments

This paper has explored economic patterns for the South African

[20] The two skills series are I(1) and cointegrated at a zero lag with a significant trend in the cointegrating equation given by: Skill_H = 1.96*SKILL_L + 0.23*TREND.

[21] The interest rate constraint and the political constraint are among the few survey responses indicated to be non-stationary and so were entered in first difference form at various lags.

[22] The α and β parameters of the GARCH(1,1) were significant at 1 % and 5 % respectively with a sum of 0.962 indicating persistence. In the estimation for Table 7 there was no evidence of an effect for exchange rate volatility. This contrasts with Li et al (2019) and Chortareas et al (2021) who found evidence of unusual positive effects.

manufacturing sector in respect of: employment; mark-ups; exports; domestic sales and investment, with the intention of seeing whether they can contribute to long-standing debates over the reasons for South Africa's deindustrialisation and slow manufacturing growth. Some of the relationships found are familiar, even if they have not achieved full consensus for the South African case and these are discussed first. .

Employment growth responds to domestic output and investment. Export volume responds strongly to a real devaluation, with some of the gain being taken as increased mark-up. There is no evidence that this effect is weakening over time, as some have argued (Section 6.3). Domestic sales volume is negatively related to unit labour costs. Relative real wages cause substitution between capital and labour. Export-orientation has produced a greater relative demand for skilled workers; this has increased the skill and managerial wage premium which constrains employment and, given the demographics of South Africa, is expressed in a skills constraint.

Other findings are somewhat contrary to mainstream expectation as generally expressed in policy papers. No significance was found for an interest rate effect on manufacturing investment. And there is only weak significance for a volatility influence on either exports or investment. By contrast, the default institutional view – as illustrated in reports by the S. A. Treasury, the Trade and Industrial Policy Secretariat, and the UN Development Programme - is that investment in South Africa is strongly responsive to the interest rate, though evidence for this is weak (Driver and Harris 2021). Similar policy documents show a tight policy consensus on the importance of macroeconomic stability and certainty for the investment and export climate, despite a lack of consistency in the underlying research reports.

The paper's findings also speak to some broader and controversial questions of policy though without identifying specific detailed remedies. Manufacturing employment is not responsive to exports. Domestic sales volume also seems unresponsive, either to exports or to the real exchange rate, meaning that trade is not an engine of growth for the manufacturing sector, despite the finding that export volumes are significantly affected by the real exchange rate. It seems likely that gains from trade are limited by the increasing foreign value-added content of exports where backward linkages are insufficiently developed (Andreoni and Tregenna 2020). The lack of transmission from exports to general manufacturing growth has not, however, been central to economic debates in South Africa. One exception noted that, for manufacturing "…there is no strong or significantly significant correlation rankings in the relative importance of export expansion and growth", a result that was found for all three sub-period that overlap with the data in this study (Tregenna 2012:177).

The results in this paper also imply a lack of productivity transmission from investment to growth. Although mark-ups have not generally trended up over the sample period, the domestic mark-up has not fallen with higher investment but has rather risen with accelerating investment. This, combined with evidence that neither output nor investment increase with higher mark-ups, suggests a lack of pressure to pursue growth, as noted in Section 5.3.

Heterogeneity within the manufacturing sector blunts the power of sector-level econometric analysis to fully investigate the transmission of investment via mark-ups. However, the literature frequently identifies upstream suppliers as being insulated from competitive pressure and in Section 5.1 we were able to illustrate some support for this view.

Overall, the lack of dynamism in the manufacturing sector revealed by these patterns of linkages from exports and investment suggests that policy has been insufficiently attentive to coordinating firms and subsectors within manufacturing. The policy stance of South Africa has tended to emphasise macroeconomic stability, so as to increase business confidence of domestic and foreign investors. But this has not boosted the manufacturing sector. The enduring challenge is to address supply conditions at a higher level than the individual firm so that manufacturing can contribute to employment growth.

Declaration of Competing Interest

I have no conflict of interests.

Data availability

The authors do not have permission to share data.

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Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.strueco.2023.10.015.

APPENDIX 1 Systems estimation

While individual equation estimation is useful for exploration, there is a case for examining the system of equations simultaneously to increase efficiency and take account of any correlated errors that may arise from common shocks and interdependencies.

A parsimonious set of equations is specified from the single equations in Sections 4-7 as follows:

$$\mathrm{EMPN} = c(1) + c(2)*\mathrm{EMPN}(-1) + c(3)*\mathrm{VOLd}(-1) + c(4)*\mathrm{ULC}(-1) + c(5)*\mathrm{ULC}(-2) + c(6)*\mathrm{ULC}(-3) + c(7)*\mathrm{INVPLAN}(-1) + c(8)*\mathrm{TREND} \quad (1)$$

$$\mathrm{MUd} = c(9) + c(10)*\mathrm{MUd}(-1) + c(11)*\mathrm{VOLd}(-1) + c(12)*\mathrm{TREND} \quad (2)$$

$$\mathrm{MUx} = c(13) + c(14)*\mathrm{MUx}(-1) + c(15)*\mathrm{VOLx}(-1) + c(16)*\mathrm{d4REER}(-1) + c(17)*\mathrm{TREND} \quad (3)$$

$$\mathrm{VOLx} = c(18) + c(19)*\mathrm{VOLx}(-1) + c(20)*\mathrm{VOLx}(-2) + c(21)*\mathrm{VOLd}(-1) + c(22)*\mathrm{VOLd}(-2) + c(23)*\mathrm{d4REER}(-1) \quad (4)$$

$$VOLd = c(24) + c(25)*VOLd(-1) + C(26)*VOLd(-2) + c(27)*ULC(-1) + c(28)*ULC(-2) \quad (5)$$

$$INVPLAN = c(29) + [ar(1) = c(30)] + c(31)*ORDd + c(32)*ORDx + c(33)*CYCLE\_D(-1) + c(34)*(ULC(-1)\text{-}Py(-1)) + c(35)*BCON(-1) \quad (6)$$

Results are shown in Table A1 for the 35 coefficients

TABLE A1
Systems Estimates: Sample 1992Q2–2015Q2. SUR estimation.

Estimation Method: Seemingly Unrelated Regression

Sample: 9/01/1992 6/01/2015
Included observations: 92
Total system (unbalanced) observations 548
Linear estimation after one-step weighting matrix

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	−22.88567	6.068933	−3.770955	0.0002
C(2)	0.306446	0.087595	3.498423	0.0005
C(3)	0.217321	0.065782	3.303649	0.0010
C(4)	0.274981	0.070982	3.873956	0.0001
C(5)	−0.116586	0.071381	−1.633281	0.1030
C(6)	−0.269619	0.079670	−3.384188	0.0008
C(7)	0.293628	0.068855	4.264420	0.0000
C(8)	0.177646	0.040040	4.436736	0.0000
C(9)	8.577155	3.246365	2.642080	0.0085
C(10)	0.195275	0.082887	2.355910	0.0189
C(11)	0.197555	0.041455	4.765535	0.0000
C(12)	−0.384782	0.063448	−6.064556	0.0000
C(13)	−5.945566	3.253458	−1.827460	0.0682
C(14)	0.305385	0.081503	3.746889	0.0002
C(15)	0.144385	0.064175	2.249855	0.0249
C(16)	−0.491844	0.106029	−4.638784	0.0000
C(17)	−0.338743	0.061084	−5.545556	0.0000
C(18)	−1.575244	1.406984	−1.119589	0.2634
C(19)	0.528346	0.099126	5.330048	0.0000
C(20)	0.262983	0.095337	2.758463	0.0060
C(21)	0.277764	0.088439	3.140762	0.0018
C(22)	−0.281789	0.087774	−3.210382	0.0014
C(23)	−0.386985	0.126775	−3.052534	0.0024
C(24)	14.24398	5.099421	2.793254	0.0054
C(25)	0.942671	0.074445	12.66272	0.0000
C(26)	−0.144024	0.071687	−2.009067	0.0451
C(27)	0.340551	0.096990	3.511208	0.0005
C(28)	−0.590982	0.097277	−6.075247	0.0000
C(29)	30.06712	8.606257	3.493634	0.0005
C(30)	0.319747	0.093491	3.420082	0.0007
C(31)	0.136112	0.045960	2.961540	0.0032
C(32)	0.155516	0.050452	3.082456	0.0022
C(33)	−0.419423	0.133200	−3.148816	0.0017
C(34)	0.134912	0.051146	2.637764	0.0086
C(35)	0.162933	0.051417	3.168849	0.0016

Notes: See text for system specification. Diagnostics:
.Eqn (1): R^2 =0.821; Eqn (2): R^2 =0.561; Eqn (3): R^2 =0.663; Eqn (4): R^2 =0.713; Eqn (5): R^2 =0.785; Eqn (6): R^2=0.771
System residual portmanteau test for autocorrelation of residuals up to lag 4: Ljung-Box Adusted *Q*-statistics p = 0.491/0.376/0.317/0.578 for lags 1 to 4 respectively.

In Table a1, the estimated coefficients have a similar pattern in magnitude and significance to those in the individual equations. All the coefficients are significant at the 0.05 level at least, apart from the two constant terms that were insignificant in the single equations and the second lag of the ULC in the employment equation. A Wald test shows that the sum of the lag terms of ULC is not significantly negative for the employment equation, but it is for the domestic sales equation (p = 0.01).

APPENDIX 2 Descriptive Statistics of the BER and Reserve Bank series

Table A1, Table A2, Table A3

There is no evidence of outliers in the data. Of the 19 variables, only two reject normality and of these, SKILL_L is only used to obtain the difference with SKILL_H with the difference satisfying the normality test at the 15 % level.

TABLE A2
Descriptive Statistics. Please cross reference with Table 1 of the text for definitions corresponding to acronyms.

	VOLd	VOLx	VOLy	ORDd	ORDx	EMPN	FIXINV	UTC	ULC	Pd	Px	EXCESS_K
Mean	6.90	−4.94	8.58	5.06	−5.38	−20.04	10.84	47.72	49.49	33.33	11.78	70.03
Median	11.00	−3.00	12.00	8.00	−7.00	−18.00	12.00	45.00	49.00	34.00	15.00	72.00
Max	63.00	47.00	60.00	58.00	53.00	27.00	35.00	93.00	86.00	76.00	69.00	87.00
Min	−65.00	−64.00	−63.00	−69.00	−73.00	−63.00	−25.00	−1.00	10.00	−16.00	−38.00	44.00
Std. Dev	27.74	23.21	25.77	27.40	23.34	19.44	14.72	20.25	14.18	19.32	24.95	9.63
Skew	−0.48	−0.19	−0.43	−0.35	−0.09	−0.06	−0.37	−0.08	0.05	−0.20	−0.31	−0.57
Kurtosis	2.83	2.61	3.11	2.72	3.21	2.96	2.38	2.57	2.86	2.78	2.39	2.90
Jarque-B	3.74	1.11	2.86	2.21	0.29	0.07	3.63	0.82	0.11	0.81	2.94	4.12
Prob	0.15	0.57	0.24	0.33	0.86	0.97	0.16	0.66	0.94	0.67	0.23	0.13
	SKILL_H	SKILL_L	IRATE	CYCLE_D	POL	INVPLAN	BCON	D4REER	DYPW			
Mean	44.80	6.23	43.17	59.81	50.97	11.57	4.08	−0.79	0.58			
Median	46.00	6.00	42.00	60.00	51.00	11.00	6.00	−1.60	0.60			
Max	67.00	19.00	82.00	80.00	79.00	62.00	73.00	27.00	4.70			
Min	20.00	1.00	20.00	34.00	19.00	−26.00	−45.00	−19.9	−6.10			
Std. Dev	9.92	3.64	15.24	10.82	14.99	17.00	22.23	9.65	1.76			
Skew	−0.50	1.34	0.48	−0.20	−0.16	0.21	0.20	0.55	−0.66			
Kurtosis	3.67	4.77	2.44	2.29	2.16	3.25	3.49	3.41	4.84			
Jarque-B	5.54	40.00	4.76	2.56	3.12	0.93	1.54	5.33	17.17			
Prob	0.06	0.00	0.09	0.28	0.21	0.63	0.46	0.07	0.00			

TABLE A3
Allocation of BER subsectors into Industrial Groups (NACE, European Union) rev 1.

	Consumer		Intermediate		Capital
1010	Meat, fish, fruit, vegetables, oils	1013	Grain mill products	1170	Structural metal products
1011	Dairy products	1040	Spinning, weaving, yarns	1181	Special purpose machinery
1019	Other food	1042	Knitted & crocheted articles	1182	General purpose machinery
1049	Other textiles	1080	Wood & wood products	1189	Office machinery, computers
1060	Wearing apparel & articles of fur	1081	Sawmilling	1190	Electrical motors, generators, transformers
1070	Footwear	1109	Paper & paper products	1194	Medical appliances, photographic equipment, watches
1090	Furniture	1130	Rubber	1200	Motor cars
1099	Other (incl. tobacco)	1140	Chemical products		Trailers & bodies for motor vehicles
1110	Printing & reproduction of recorded media	1153	Glass	1201	Parts & accessories for motor vehicles
	Publishing	1159	Other non-metallic mineral products	1209	Other transport equipment
1120	Leather & leather products	1160	Basic iron & steel & castings thereof	1220	Petroleum (not included in the BER Survey data)
1149	Other chemical products	1161	Basic precious & non-ferrous metal products; and castings thereof		
1189	Domestic appliances	1179	Other fabricated metal products		
1192	Radio, TV & communication apparatus	1191	Electricity distribution apparatus		
1020, 1021	Beverages		Insulated wire & cables		
			Batteries		
		1199	Electric bulbs & tubes		
			Other electrical equipment		
		1219	Plastic		

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