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Capital Investment: what are the main long term trends in relation to UK manufacturing businesses, and how do these compare internationally?

Future of Manufacturing Project: Evidence Paper 8

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Capital Investment: what are the main long term trends in relation to UK manufacturing businesses, and how do these compare internationally?

By

Professor Ciaran Driver

Imperial College London

&

Dr. Paul Temple

University of Surrey

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Contents

Executive summary

1. The UK share of capital investment in output has been low relative to competitor economies for many decades and continues to be so, both for the whole economy and for manufacturing. These trends are also reflected in growth rates of the fixed capital stock which were negative for capital stock growth 2000-07. For ICT investment, the trend was better and closer to that of other economies.

2. Because the UK has experienced rapid decline in manufacturing employment in recent decades, the lower capital investment is consistent with a better performance in growth of capital per worker and has been about the average of competitor countries. This capital deepening is not the result of re-allocation of resources between sectors but common across sectors.

3. There are no official current figures for capital per worker *levels* at sector level, but the McKinsey Global Institute estimates that there is a large gap between UK manufacturing in terms of the capital shortfall to match the best performing comparator countries.

4. In relation to R&D expenditure, the UK now allocates proportionately less resources from GDP to R&D than in 1990; this was also true of the period 2000-7. However, the ratio of Business R&D to manufacturing value added has - alongside all our comparator economies (bar Italy) – increased. There has been a marked shift in Business R&D allocation from engineering to pharmaceuticals.

5. General claims that intangible capital is compensating for lower tangible capital should be treated with circumspection. Some estimates indicate that the number of intangible workers in the UK has remained fairly constant over time.

6. In relation to education and training there is a skills deficit in continuous vocational training in manufacturing and elsewhere. Manufacturing coverage of training is lower than elsewhere in the economy and that coverage may even be shrinking over time. Overall, education and training is polarised in relation to competitors with a greater percentage at both high and low ends in the UK; this polarisation is expected to persist and even increase beyond 2020, in contrast to the average prediction for EU countries.

7. In relation to management education and skills, within manufacturing, the category of managerial and professional employees is found to have less formal qualifications than elsewhere in the economy – in 2010 more than half had lower than level 4 qualifications. A body of work has identified a correlation between deficits in skills and poor business and product strategy, creating a cycle of poor performance and prospects.

8. For the UK, the intensity of Foreign Direct Investment (FDI), both inward and outward, corresponds more to that in smaller European economies (Denmark, Netherlands and Sweden) than to similar sized comparators (Germany, France, and Italy). The overall outward asset position in manufacturing for the UK (at around 70% of GDP) is far larger than its inward liabilities (around 50%).

9. Nearly one half of UK manufacturing investment (46.5% in 2009) and nearly a third of employment is undertaken by foreign owned multinational enterprise. The impact of inward FDI on the economy depends on a number of characteristics including the extent to which spillovers may benefit other firms and the effect of FDI on exports. There is mixed evidence on spillovers. In relation to exports, FDI firms tend to be more export oriented. However in some industries such as motor vehicles this results in exports being focused on the EU which is of strategic importance to the firms concerned but, arguably, less so for the economy which loses out on sales to faster growing markets.

10. In relation to outward FDI, assets related to manufacturing comprise only about a fifth. The bulk is in developed countries with a strong focus on the US which may indicate an aim of accessing new technology. The ratio of UK sales from foreign affiliates to exports from the UK is slightly higher than France or Germany though much lower than for the US.

11. Manufacturing exports make up over half of the total of all exports of goods and services, something that gives it a key role in contributing to the correction of trend deterioration in the current account. If the share of investment in value added of UK manufacturing were to rise to the average for comparator, it would result in an export boost arising from both conventional price as well as non-price factors. There may be additional favourable impacts on the current account operating through an improved competitive position of import competing sectors.

12. The slow growth of UK investment *vis a vis* competitors such as Germany seems to reflect a failure to translate productivity growth into output growth so that investment opportunities made possible by the productivity growth itself are not being taken up. Put differently, a robust relationship exists between productivity growth and output in Germany that has not been observed for the UK for more than a decade.

13. Investment since the financial crisis has been particularly poor both absolutely and in comparison with competitor countries. Business investment remains around 20% below where it would have been had it continued to grow at its pre-2008 average rate and projections for investment growth in the next four years are around 6%, little more than half that forecast by the OBR in late 2012.

14. Since the financial crisis, investment has become very unstable for both large and small firms, with a more variable response to business optimism. External financial constraints that are constructed to be independent of the cycle appear to affect both small and large firms though the main change here since the onset of the crisis is the effect on large firms. The instability in the large-firm coefficient on optimism suggests that long-run confidence will need to be established in some general way before investment is likely to resume.

15. Policies to stimulate investment include institutional design to facilitate public decision-making and strategy implementation. Consideration should be given to the formation of an overarching policy making unit.

16. Public interventions may be needed to support the financing of investment and training in manufacturing. Consideration should be given to capital goods firms establishing educational units, to the re-introduction of training levies and to

government financing of options on capital goods orders linked to free front-loaded training by suppliers on demonstration capital goods.

17. There is a need to strengthen managerial education in manufacturing to prevent poor decision making such as a bias against risk, especially in the procedures by which SMEs gauge investment.

18. Consideration should be given to the links between corporate governance and managerial decision-making and in particular to the role of corporate managers in supporting a short-term bias. There is evidence that senior management itself has become culturally conditioned to short-termism, partly perhaps as a result of high powered incentive systems. Reforms here may need to address a more inclusive system of decision-making within the firm and in particular the role of management levels below the most senior level.

1. Introduction

It is generally agreed that a sectoral shift of resources toward manufacturing is now required for the UK economy - not only because of a contraction of finance and related services, but also for the purpose of rebalancing the economy in a number of dimensions, including regional development and export growth. There is a danger that discussion of such a shift will be coloured by a reluctance to contemplate large-scale change and by pessimism regarding its feasibility. However, it is worth remembering that the UK experience of structural change since the early 1980s has been remarkably radical in comparative terms, even if some of it ultimately proved unsustainable. The fall in the share of UK manufacturing in overall output from a third in 1970 to little more than a tenth in forty years has little by way of parallel; even in the US, manufacturing's decline has been considerably more gentle. While the manufacturing sectors in some other advanced countries such as France, the Netherlands and Denmark today constitute a similar fraction of output to the UK, the pattern of change has been far less profound (World Bank 2013).

There are examples of countries that have been successful in stemming - or even reversing - a decline in manufacturing. Finland's share of manufacturing in nominal GDP remained broadly stable at high levels between 1980 and 2000, with policies introduced to reverse a sharp decline of the early 1990s. In Germany manufacturing's share was kept broadly stable from the mid 1990s to the onset of the financial crash. For the UK, many industrialists have highlighted policy choices for manufacturing. Sir John Rose, former CEO of Rolls Royce, commented just before the financial crash on how the UK was closing down its options by concentrating activity so heavily in financial services and relying on inward investment to fill gaps in industrial supply. He criticised the lack of a UK industrial strategy, pointing to how political will had been important in France when building on the failed Concorde project to establish the Toulouse industrial hub of 100,000 high paid industrial jobs; and how the US success was based on integrating education and research with industrial priorities. (Rose 2007)[1]. These and other examples suggest that a framework for industrial strategy is important if manufacturing to flourish.

This chapter provides background information to help with policy choices in respect of manufacturing investment. It is organised in four substantive sections beginning with (2) an account of the statistical record on broad investment categories in manufacturing followed by (3) a discussion of inward and outward flows in foreign direct investment, before presenting (4) an analytical view of manufacturing investment and (5) a view of the determinants and constraints on investment. We finish (6) with some discussion of policy choices.

[1] Sir John Rose, The Dennis Gabor Lecture 2007: http://www3.imperial.ac.uk/events/dennisgaborlecture

2. Manufacturing investment: the record up to the financial crisis

The topic of UK investment has been the subject of endless handwringing for many decades. At the level of the *whole economy* Table 1 illustrates that, for the proportion of GDP allocated to fixed investment, the UK has consistently been at the bottom of international league tables with comparator countries such as the G7, Korea and European countries. This has remained true also for the decade from 2000, both before and after the financial crash. Table 1 also suggests that a similar story has prevailed for *manufacturing* fixed investment where, for the period from 2000 up to the crash, the average share of value added invested had slumped to a mere 10.5%. Both the 1960s and the period since 2007 have been excluded for reasons of data availability and the recent revision to the definition of manufacturing; the record for the period since 2007 is discussed later.

Table 1

Ratios of Gross Fixed Capital Formation to GDP (%)

Whole Economy

	1960-69	1970-79	1980-89	1990-99	2000-07	2008-11
Canada	22.2	22.5	21.1	19.1	20.4	22.2
Denmark	22.3	24.1	19.7	18.7	20.1	18.5
France	22.5	24.0	20.6	18.9	19.2	20.1
Germany	24.8	21.7	19.3	20.6	18.6	17.8
Italy	22.0	25.3	22.5	19.7	20.9	19.9
Japan	31.6	33.1	29.3	28.7	23.1	21.0
Korea	17.0	26.8	29.7	35.4	29.0	28.5
Netherlands	25.3	23.9	21.3	21.6	20.0	18.6
Sweden	23.6	20.7	20.7	17.5	17.9	18.6
UK	**18.6**	**19.9**	**18.4**	**17.2**	**16.9**	**15.3**
US	19.7	19.7	20.1	18.2	19.5	16.1

Source: IMF IFS (Annual) January 2013

Ratios of Gross Fixed Capital Formation to Gross Value Added

Manufacturing

	1960-69	1970-79	1980-89	1990-99	2000-07	2008-11
Canada		13.9	15.1	13.7	10.2	..
Denmark		12.6	14.3	17.0	17.2	..
France		17.0	16.1	15.9	15.3	..
Germany		..	..	15.1	13.4	..
Italy		25.0	22.2	23.3	25.3	..
Japan		..	..	..	..	..
Korea		32.3	31.8	33.0	28.8	..
Netherlands		15.7	18.2	17.1	13.4	..
Sweden		18.9	19.0	18.2	17.0	..
UK		**13.4**	**13.2**	**13.2**	**10.5**	**..**
US		11.2	12.1	13.3	11.4	..

Source: OECD (2010)

A low gross fixed investment share in output will be reflected in a lower growth rate of the UK's capital stock than elsewhere, assuming fairly similar capital output ratios and asset compositions. More detailed investment and capital stock data – based on similar national sources to the OECD data reported in Table 1, is provided in the EU KLEMS database. This allows for comparison with a number of the economies in Table 1. From

here there is some evidence, reported below, that the UK is increasingly focused on shorter-lived assets such as ICT equipment; to the extent that this is the case it will cause the comparative figures to be flattered in favour of the UK because the depreciation rate is higher for such assets. Figure 1(a) confirms that the capital stock in manufacturing has been growing comparatively slowly over the two decades, while the modest growth seen between 1990 and 2000, actually turned negative in the run-up to the financial crash, between 2000 and 2007.

Figure 1(a) Growth Rates of manufacturing fixed capital stock: All Assets

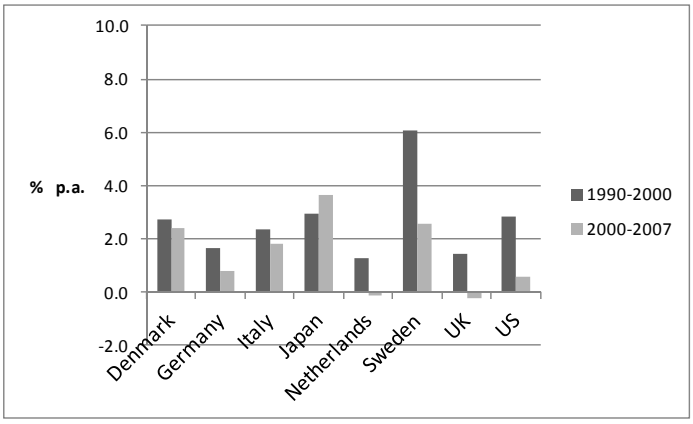


Figure 1(b) Growth rates of manufacturing fixed capital stock: Non-ICT

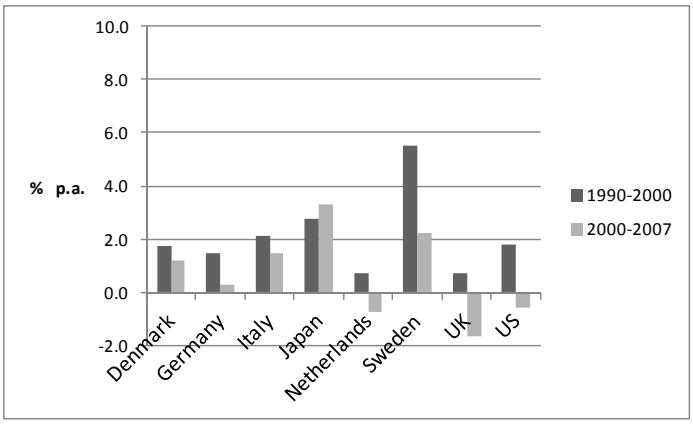
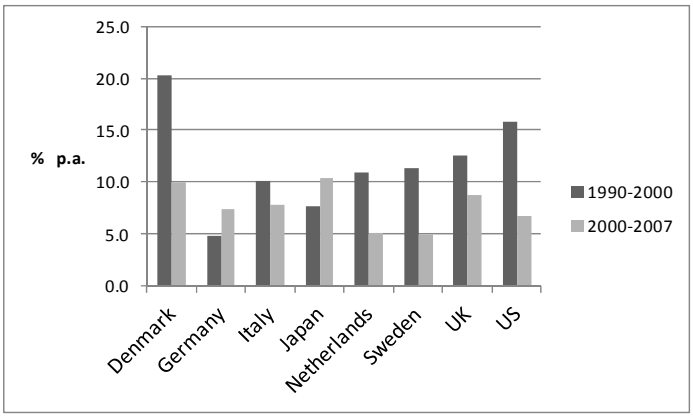


Figure 1(c) Growth Rates of manufacturing fixed capital stock: ICT



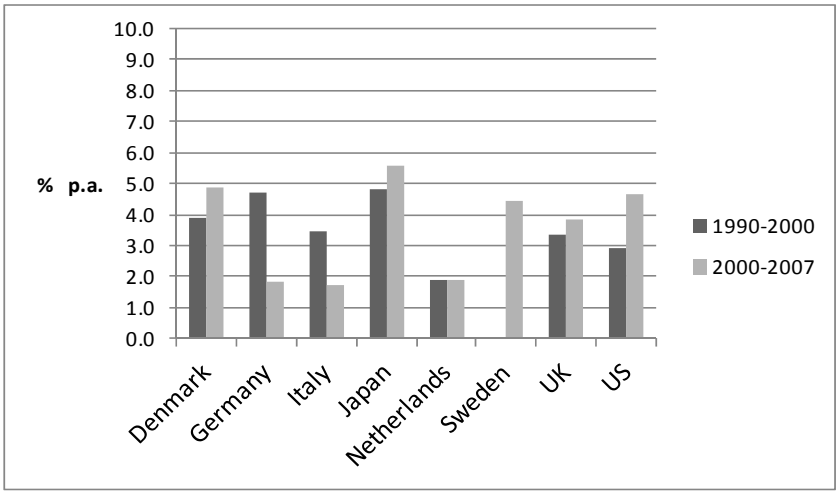
Source: EU KLEMS 2009 edition, 2011 update; Note: For Sweden data are for 1993-2000

Figure 1(b) shows that the deceleration was especially severe for non-ICT assets, which still make up the bulk of the sector's capital stock, while as Figure 1(c) shows, growth

rates of manufacturing's ICT assets more closely resembled the experience of the other economies. There are other ways of measuring the fixed assets available for manufacturing; a measure of capital services may be preferred to the more familiar stock measures (O'Mahony and Timmer 2009) but this measure suggests a similar story both in absolute and comparative terms, with the UK showing a marked deceleration in the growth of the aggregate volume of capital services between the two periods and negative growth between 2000 and 2007.

Despite the low (and recently negative) rates of growth of UK manufacturing's fixed assets and the services they provide, the rapid decline in employment over several decades has meant that this has been quite consistent with a continuing process of capital deepening. On a per worker basis, Figure 2 shows that the UK is at least an average performer against the same sample of economies.

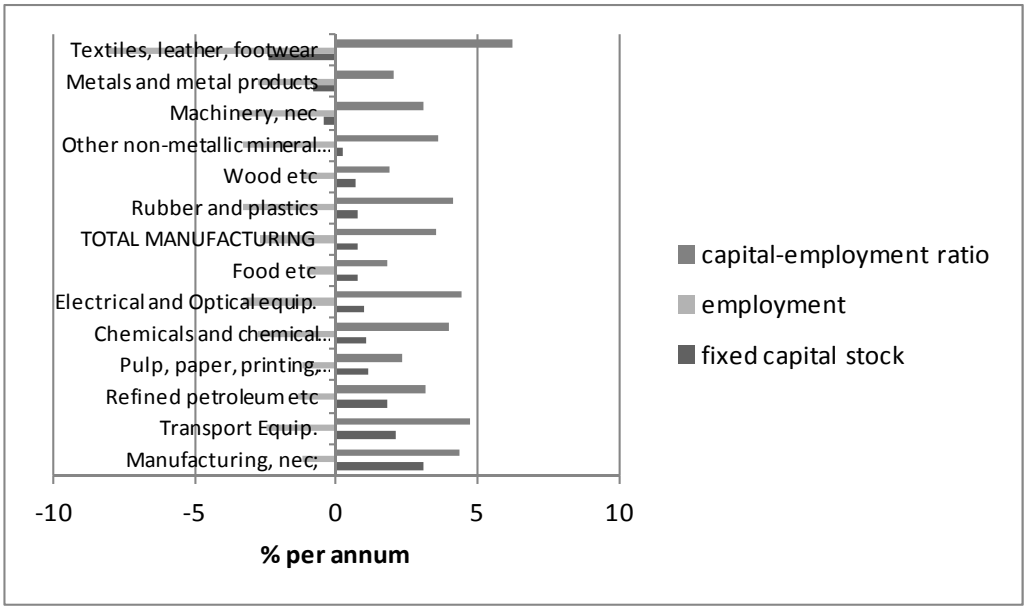
Figure 2: Growth in Capital Stock (all assets) per person employed



(Source: EU KLEMS 2009 edition, 2011 update; Swedish data not available 1990-2000)

Looking at the process of capital deepening from a sectoral perspective presents a rather homogeneous picture. As Figure 3 – arranged according to the extent of overall capital stock growth for 13 sectors of UK manufacturing - shows, the period 1990-2007 has been characterised by sluggish capital stock growth (this ranged from the high of 3.1% per annum in transport equipment to a low of -2.3% per annum in Textiles, footwear and leather) combined with ubiquitous employment losses. The latter ranged from the 'high' of -1.0% per annum in Food, drink and tobacco, to the low of -8.1% per annum in Textiles, footwear and leather, a sector which paradoxically thereby achieved the fastest rate of capital deepening. The aggregate manufacturing figures therefore tell an accurate story of what is happening to individual sectors. Indeed, a formal shift-share analysis showed that the process of capital deepening in manufacturing in general owed nothing to any shift in employment between more or less capital intensive sectors.

Figure 3: The process of capital deepening in UK manufacturing sectors 1990-2007



(Source: EU KLEMS 2009 edition, 2011 update; own estimates)

The available data reported in Figure 3 records growth rates only. In terms of *levels* of fixed capital assets, official UK data is not currently being published. Recently however, McKinsey have attempted to compare levels of the capital stock per person employed for 8 UK sectors with a peer group of 10 EU economies. For each sector, the additional expenditure on capital stock required to close the gap with the average of the top-half of its peers is used as an indicator of untapped investment opportunities. While other sectors have larger shortfalls (notably in construction and real estate), that in manufacturing is estimated at a substantial €137billion at 2005 prices (McKinsey Global Institute 2012).

The data in Table 1 and Figures 1-3 deal with fixed investment only. This is an important category of expenditure because it has recently been shown that fixed investment shares are linked, not only with long run productivity *levels* (as suggested by standard neo-classical 'exogenous' growth theory) but also with long run productivity *growth* (as in some versions of 'endogenous' growth theory). The link between investment and productivity levels is generally accepted by economists (Bernanke and Gurka++ynak 2001). Econometric analysis suggesting that the fixed investment share does causally raise long-run productivity growth is provided by Coakley and Wood (1999) and more recently by Bond et al (2010) who provide evidence for both types of link, although that between investment shares and productivity growth appears less robust for the OECD countries than for the non-OECD economies sampled.

Some have objected to according such a crucial role to *fixed* investment and argue that intangible forms of investment are assuming equal if not greater importance for productivity, so that measuring the balance of an economy between consumption and investment using conventional national income accounting definitions of fixed investment may be misleading. For some such as Aghion (2006), fixed investment itself is seen as a 'plug and play' item that cannot confer competitive advantage to the individual firm because it is equally available to all in global markets. Instead the underlying technical knowledge acquired through R&D expenditure is what matters. R&D is not only a source of productivity growth but helps companies absorb new technical information which would

otherwise be overlooked or unutilised. Furthermore, R&D knowledge leads to the discovery of new investment opportunities (Nickell and Nicolitsas 1996).

However, the data for UK R&D do not conflict with the pattern for fixed investment. As Table 2 indicates, UK business in total spends less of its GDP on R&D then most of our sample of economies, whether measured by business expenditures on R&D (BERD) or in terms of the overall level of R&D expenditure (GERD) - which includes expenditures by both government and institutions of higher education. Compared to the 1990s, by either measure the UK now allocates proportionately less resources to R&D both in the run-up to the crash (2000-07) and subsequently, in contrast to an increase in share by a number of other economies. By 2010, the UK was considerably behind both the Scandinavian economies in the sample, as well as Japan and Korea. Today the latter economy spends double the share of GDP on R&D of Britain. As Hughes (2012) has noted, among the sources of R&D spending, only that performed by Higher Education has taken a clearly rising share of GDP, as in most other economies, but even here a weaker trend is in evidence since 2005.

Table 2

Ratios of Expenditure on R&D to GDP (%)

	Business Expenditure on R&D (BERD)			Gross Expenditure on R&D (GERD)		
	1990-99	**2000-07**	**2008-10**	**1990-99**	**2000-07**	**2008-10**
Canada	0.9	1.2	1.0	1.7	2.0	1.9
Denmark	1.1	1.7	2.1	1.8	2.5	3.0
France	1.4	1.4	1.4	2.3	2.2	2.2
Germany	1.6	1.8	1.9	2.3	2.5	2.8
Italy	0.6	0.5	0.7	1.1	1.1	1.2
Japan	2.0	2.4	2.6	2.9	3.2	3.4
Korea	1.7	2.0	2.7	2.2	2.7	3.6
Netherlands	1.0	1.0	0.9	2.0	1.9	1.8
Sweden	2.3	2.7	2.5	3.2	3.7	3.6
UK	**1.3**	**1.1**	**1.1**	**1.9**	**1.8**	**1.8**
US	1.8	1.9	2.0	2.6	2.6	2.9

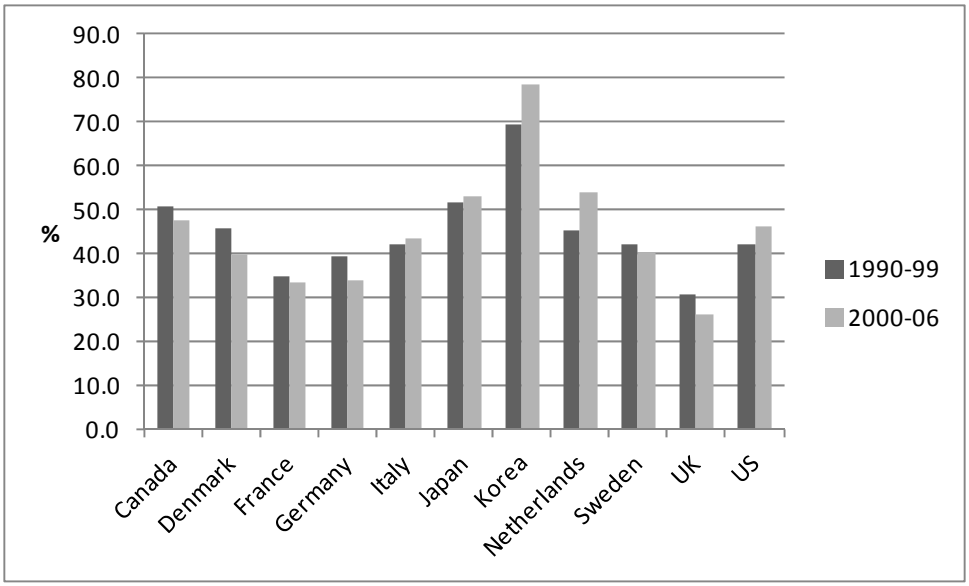
Source: OECD Main Science and Technology Indicators (2012 edition)

Since the bulk of business sector R&D spending remains within manufacturing (some 72% in 2011 – ONS 2012) a proximate cause of the declining share of R&D has been the sharp decline in the share of manufacturing in the overall economy. Focusing only on manufacturing R&D, we can see from Figure 4 that the ratio of BERD to manufacturing value added has - alongside all our comparator economies (bar Italy) - been *increasing*. Moreover, the latest data from the ONS suggest that since the crash the intensity of these R&D expenditures has at least held up (ONS 2012).

But this is by no means the whole story. Over the last three decades there has been a considerable shift in the shares of R&D performed *within* UK manufacturing. As noted in Driver and Temple (2012), the biggest slice of manufacturing R&D two decades ago was related to engineering products (over 30% of *total* business spending on R&D in the 1980s). This has since dwindled to below 20%, its share taken up - almost exclusively – by the R&D related to pharmaceutical products. A similar pattern has *not* been repeated in our sample of comparator countries. Figure 4 shows that the UK share of manufacturing R&D devoted to mechanical, electrical, electronic and instrument engineering – already low in the 1990s, continued to fall after the millennium and is today far lower than any other economy in our sample. Does it matter? At the very least it marks a considerable shift in the nature of the knowledge production and spillovers. Arguably, engineering is disadvantaged because its innovation outputs are difficult to

value or market until commercialisation whereas a more liquid market in ideas exists for pharmaceuticals. The implication is that the balance between these sectors is likely to depend on whether a market-oriented or a hands-on policy regime is in place.

Figure 4: Shares of manufacturing BERD devoted to engineering products



Source: (OECD 2010)

Beyond R&D, some economists have extended the notion of intangible investments to include all firm expenditure that conveys competitive advantage with durability of longer than a year – the conventional cut-off for fixed investment (NESTA 2011). According to this we should capitalise various expenditures such as advertising, business models, etc. This could certainly change the results of international comparisons. For example including forms of intellectual property such as branding makes for some narrowing of the R&D gap with France and Germany but not its elimination (Hughes and Mina 2012). There is wheat and chaff in proposals to define investment as inclusive of intangibles. While it can be argued that intangibles constitute an asset complementary to successful innovation and investment, it is important to consider the question not just from a firm but also from a macroeconomic perspective. For example, adversarial advertising may result in no aggregate capital at the level of the whole economy, and is just a question of maintaining market share. Similarly, some business models may be more related to business stealing effects and/or rent capture. There seems only weak evidence for the idea that intangible assets are increasingly displacing fixed assets. As noted in Bond and Cummins (2000) some commentators have confounded temporary rises in stock market valuations with the rise of intangible capital. Furthermore, the valuation of tangible to intangible capital reverts to a constant mean over a long time period.[2] Estimates of intangible capital growth also vary widely. While NESTA (2011) suggests that intangible investments have been rising considerably faster and far more than tangible ones, National Institute economists Riley and Robinson (2011), using a different methodology, note that both the number and real cost of intangible workers in the UK has remained fairly constant over time. These authors exclude some purchased intangible inputs and will therefore exclude some expenditure on items such as consultancy for branding or re-organisation. Nevertheless there must be severe problems in measuring the contribution and depreciation of such inputs. The Finance sector was the second largest investor in

[2] http://www.smithers.co.uk/page.php?id=34

(own and purchased) software, branding and organisational capital in 2007 (Goodridge et al 2012) and it is unclear how account has been taken of any accelerated depreciation of such assets.

Whatever view is taken on the broad issue of intangibles, clearly some categories such as innovation and training are important complementary inputs to fixed assets. In relation to training, there is particular concern in respect of manufacturing. Table 4 reveals that for manufacturing, a lower proportion of the workforce is trained to the top skill levels and that gap seems to have widened over the 2000s. This is perhaps surprising in view of the image of UK manufacturing as moving towards higher value added production. Manufacturing also has a higher proportion than other sectors of those with the *lowest* skill level and this gap is not closing.

Within manufacturing, the category of managerial and professional employees is found to have less formal qualifications than elsewhere in the economy – in 2010 more than half had lower than level 4 qualifications. Data on training, shown in the last row of Table 4, indicates that manufacturing coverage of training is lower than elsewhere in the economy and that coverage may even be shrinking over time both absolutely and in relation to the whole economy.

Table 4

Qualifications & Training for Manufacturing, UK 2002-2010[a] (whole economy figures in brackets)

	2002	2006	2010	Projected 2020[b]
% at Level 4+	22(28)	26(32)	29(37)	(44)
% at Level 3	22(20)	22(19)	22(20)	(17)
% at Level 2	22(22)	22(22)	21(21)	(19)
% at Level 1 & below	34(30)	31(27)	28(23)	(20)
% of Managers and Professionals without Level 4+ qualification				
% Less than Level 4+	55(45)	53(43)	51(39)	
% of employees receiving training in last 13 weeks 2002-2010				
% receiving training	21(28)	19(27)	18(26)	

[a]Source: Manufacturing: Sector Skills assessment 2012 Tables 4.9;4.10;4.12;4.13;4.19: UK Commission for Employment and Skills
[b]These estimates relate to whole economy for 19-16 year olds, Bosworth 2012, UKCES Evidence Report 70

Table 5

Hours in Continuous Vocational Training courses per employee (selected EU economies)

Manufacturing 2005 and Whole Economy 2005, 2010

Country	Hours of training per employee, manufacturing 2005[a]	Hours of training per employee, whole economy 2005[b]	Hours of training per employee, whole economy 2010
Germany	10	9	NA
France	13	13	13
Italy	5	7	NA
Netherlands	13	12	14
Denmark	10	10	NA
UK	**5**	**7**	**8**
EU average	9	9	NA

Sources:

a Manufacturing: Sector Skills assessment 2012 Tables 4.24 UK Commission for Employment and Skills Evidence Report 76 November 2012: Original Source: Eurostat, 2011 (from CVTS3, 2006); http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=tmg_cvts72&lang=en
b http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=tmg_cvts72&lang=en
c Respondents were told that Continuing Vocational Training is defined as pre-arranged training that was at least partially funded by their organisation, or training that took place during employee's paid working time. Training for apprentices, trainees, work experience, people working on a training contract and inductions were not to be included as Continuing Vocational Training. DIUS Research Report 08-17 Continuing Vocational Training Survey 2005 (CVTS3) *Rhian Dent and June Wiseman, BMG Research*

Table 5 shows international comparisons for skills training with other countries for manufacturing and the whole economy. Interpretation of cross-country differences is affected by definition and classifications but some consistent comparisons are possible across EU countries. Table 5 shows data on hours of continuous vocational training per employee in manufacturing across selected EU countries. For manufacturing the comparisons are only available for 2005 and they appear to show the UK in the lowest position. It is striking that the Netherlands, which appears to have a similar economic structure to the UK, appears to spend two-and-a-half times the number of training hours per worker than the UK.

While the data in Tables 4 and 5 appear to show a significant skills deficit for manufacturing, this should be set in the context of an overall view of different strengths and weaknesses of the UK education system. Table 6 shows the comparative position of the UK in 2010, with projections for 2020, in terms of low, intermediate and high skills qualifications.

Table 6

UK % Qualification of workforce by band (EU average in parentheses)

UK % qualified	**2010**	**Projected 2020**
Low: Below upper secondary	28.0 (25.3)	19.2 (11.9)
Intermediate: Upper secondary but not tertiary	36.8 (47.7)	34.7 (51.8)
High: Tertiary and above	35.0 (27.0)	46.1 (36.4)

Source:
Bosworth, D.L. (2012) UK skill Levels and International Competitiveness, UK Commission for Employment and skills, Evidence Report 70, Tables 8 and 9

The UK is unusually polarised and will continue to be so by 2020, with only 35% in the middle tier as opposed to an EU average of over 50%. The UK has - and will continue to have - a relatively high proportion of the least qualified in relation to the EU where the proportion is projected to be approximately half that of the UK by 2020. At the same time the UK, already with an eight point lead over the EU in the percentage of tertiary-educated is expected to stretch that lead to over ten points.

Such projections are of course based on existing trends. The implications for manufacturing are hard to judge. On the one hand the large number of graduates coming through each year in the UK may indicate that the apparent under-representation of high skills in manufacturing could be easily reversed. On the other hand there are those such as Sir John Rose who worry about the shortage of STEM graduates who are likely to stay in the UK and worried that British students are “shunning the higher reaches of demanding subjects” (Rose 2007).

Of course skills are only directly valuable if there is a perceived need for them. While data on skill shortages and skill gaps reveal pressure in some areas of manufacturing there is also evidence that managers believe their employees to be over-qualified. The issue that arises here is one of co-evolution of work processes and skill levels. As Finegold and Soskice (1988) noted in a classic work: “Skill shortages reflect the unsatisfied demand for trained individuals within the limits of existing industrial organization, but they say nothing about the negative effect poor ET may have on how efficiently enterprises organize work or their ability to restructure” (p. 24). The latter is

seen as an interconnected issue involving political economy questions such as the governance of firms, the regulation of industry, industrial relations system, and the operation of financial markets. Revisiting these issues from a different perspective Mason (2011) has looked at the correlation between skill levels and product strategy, discovering them to be highly correlated for manufacturing. This raises the possibility that skills may be pre-requisite for a change in strategy but it also suggests that strategy, work-processes and even factory designs may be plumbed into British manufacturing as a consequence of past failures in the policy set, identified in Finegold and Soskice. The issue here relates particularly to management training and practices. Work done by the CEPR at LSE shows that the UK is in the second rank (with France, Italy and Poland) in so far as advanced management practices are concerned with a higher level group consisting of the US, Sweden , Japan and Germany using scores on operations management, performance management and people management (Bloom et al 2011). This underscores the UKCES view that “too many manufacturers react to change rather than anticipate it” even where trends are largely predictable (Evidence report 76). Such thinking is probably especially important for the “low tech” sector (defined on R&D intensities) that accounts for about 22% of manufacturing output and employment. Here the trends are probably predictable, and the challenge is to adapt to them in innovative ways through management and product strategy (Brinkley 2009). Similar issues arise in much of the SME sector where firms tend to be “...reactive to immediate market and customer demands” as they lack professional forecasting and financial modelling skills (Davis et al 2012; UCKES evidence report 48 p.24).

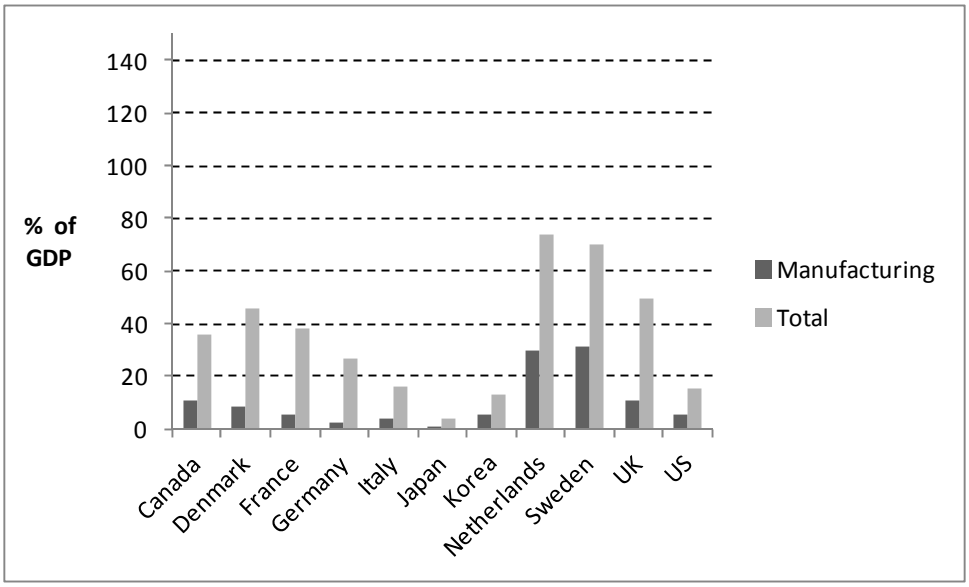
The above review of fixed investment, R&D and training, particularly in relation to the manufacturing sector, demonstrates a consistent picture where the UK trails most of its competitors and where trend movements are generally not encouraging. There are probably deep-seated institutional reasons for such a pattern that simultaneously affect decisions on fixed investment, innovation and training. Our focus on fixed investment in this chapter is not intended to distract attention from complementary assets and the expenditures required to create investment opportunities. Fixed investment seems a good broad indicator because of the correlation that it appears to have with these complementary assets. For example, the correlation between training and machinery equipment and software is between 0.39, and that between training and intramural R&D is 0.36 across a large sample of manufacturing firms (Bulli 2008, Table 3). Only 5 per cent of firms invest in training without at the same time acquiring machinery or software, compared with 35 per cent who invest in both (Bulli 2008, Table 9). The narrower focus on innovation that is popular in current policy does not present a different picture. In European comparisons, where standardized innovations surveys have been implemented for many years, the UK is placed on the basis of a composite indicator, as an innovation ‘follower’ (with Germany, Finland, Sweden and Denmark acting as leaders [EC 2012]).

All of the indicators of broad domestic investment considered reflect the aggregate decisions made by enterprises to take on risk and to commit to production. We now move on to address the separate question of the ownership by British companies of manufacturing assets abroad and the associated question of foreign ownership of the UK’s manufacturing assets.

3. Foreign direct investment in manufacturing

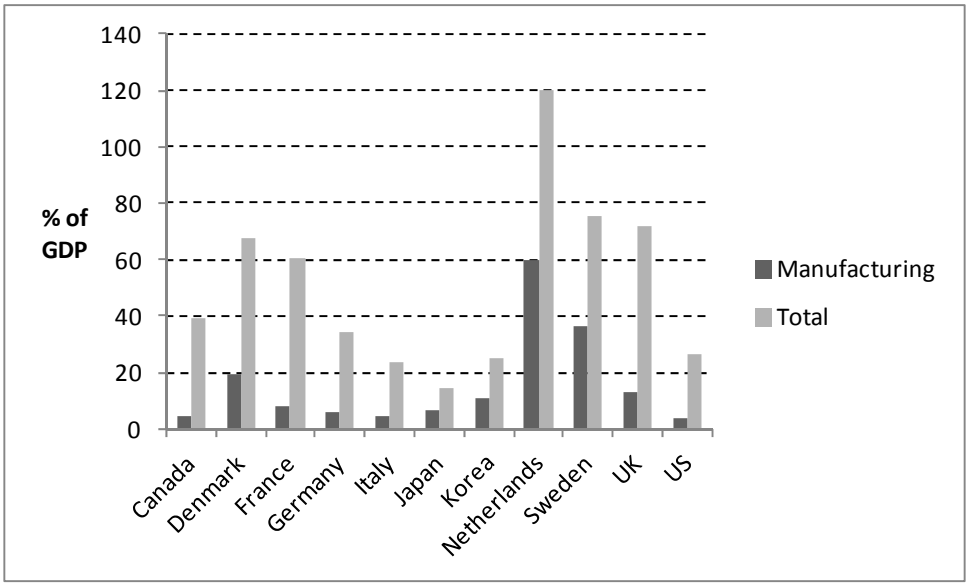
Foreign Direct Investment (FDI) refers to a conceptually distinct set of transactions from those examined in the last section, since the bulk of it occurs through changes in the ownership stake in 'affiliated' enterprise held in another country. Statistical definitions are somewhat arbitrary – a stake of 10% of the equity being considered enough to constitute an effective 'voice' in an affiliate and constitute FDI, whereas lower stakes are taken to be an example of the wide class of 'portfolio' investments. Other types of capital transaction, such as retained earnings within an affiliate, also constitute FDI. Some FDI takes the form of 'greenfield' investments which generate new physical capacity. However the bulk of FDI tends to be acquisition activity, also known as 'brownfield' investment. For example, capital investment in inward greenfield projects or 2011 for the whole of Europe was $167billion, according to FDI Report 2012 by FT Business, as compared with over $400billion reported by the OECD for inward FDI for the EU for 2011. The UK generally takes an important slice of inward greenfield FDI – with nearly one fifth of Europe's inward investment projects in that year. It was also a significant player in outward FDI with the largest number of projects, at 1,359 nearly 10% more than Germany and more than double that of France (FT Business 2012).

Figure 5(a): Inward Stock of FDI as % of GDP 2010



(Source: OECD accessed 03/03/2013)

Figure 5(b): Outward Stock of FDI 2010 as % of GDP



(Source: OECD.StatExtract accessed 03/03/2013)

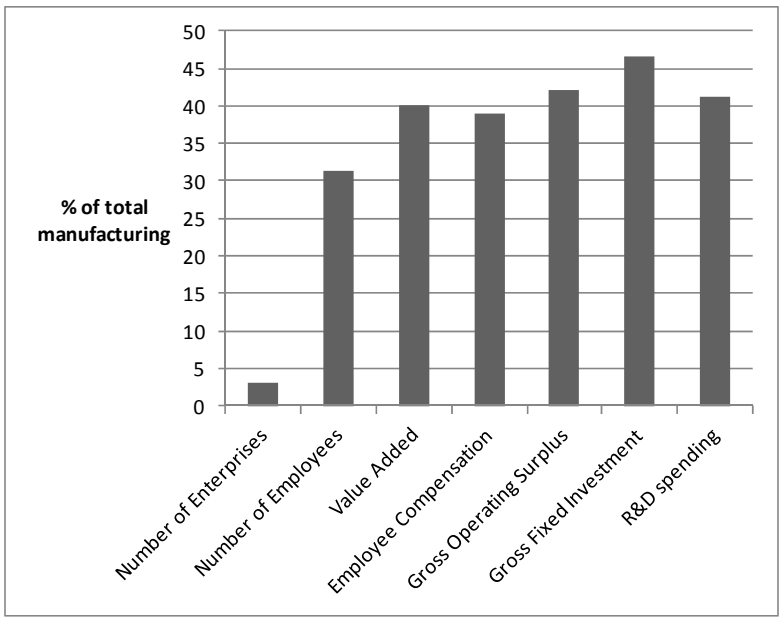
The relevance of FDI for UK manufacturing can be gauged by looking at FDI stocks – cumulative totals of FDI at historic cost – and comparing these with GDP. Figures 5(a) and 5(b) show, for our sample of economies, the inward and outward FDI stock as percentages of GDP, both in total and for manufacturing. The high FDI intensity observed for UK FDI stock, both inward and outward corresponds more closely to the smaller European economies (Denmark, Netherlands and Sweden) than to similar sized comparators (Germany, France, and Italy). For the UK it can be also be seen that its overall outward asset position (at around 70% of GDP) is far larger than its inward liabilities (around 50%).

Because the implications of inward and outward investment are rather different, we consider both in turn.

3.1 Inward FDI

A welcoming hand for inward FDI in manufacturing has been an enduring part of the industrial policy landscape in the UK. The importance of foreign ownership for a range of manufacturing indicators is shown in Figure 6. It can be seen that the shares taken by foreign owned enterprise in employment, value added, and both fixed investment and R&D spending were all above 30%. Moreover, nearly one half of UK manufacturing investment (46.5% in 2009) is undertaken by foreign owned multinational enterprise.

Figure 6: Shares of Foreign Owned Enterprise in Total UK Manufacturing in 2009

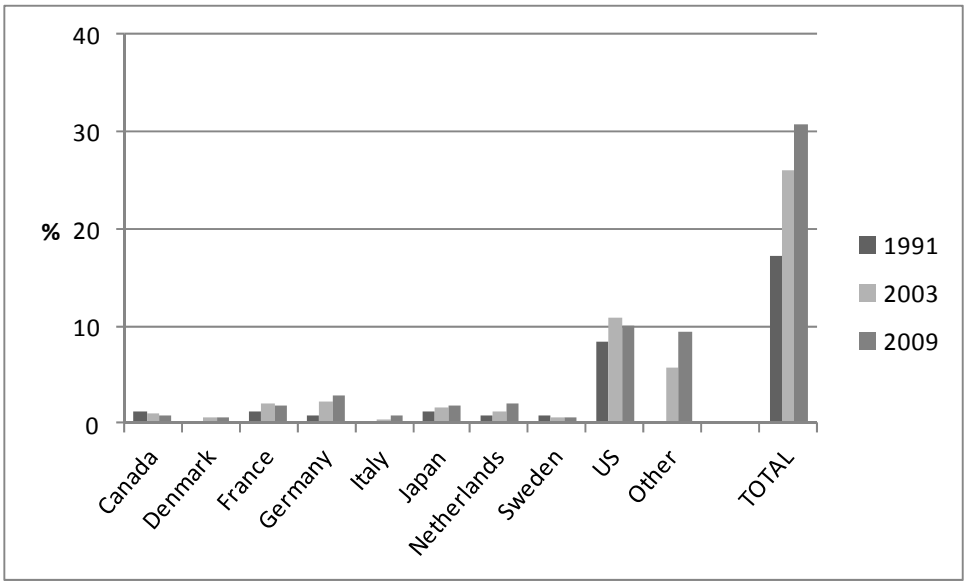


(Source OECD.StatExtracts)
Note: data for R&D are for 2006 and for ISIC 3

Does the extent of foreign ownership of UK manufacturing matter? Multinational enterprises tend to have some form of competitive advantage (i.e. an intangible asset, usually knowledge based asset in innovation, organization, marketing etc) which more than compensates for the costs of locating production overseas. Over the last decade, specific evidence for the UK, based on plant and establishment level data, has been used to determine whether foreign owned enterprises are more productive than similarly situated domestically owned enterprise (in terms of size, sector and so forth). Broadly, results based on plant level data in the UK have confirmed the superiority of multinational enterprise over purely domestic firms - which perhaps is not surprising - but also that there exists a productivity premium for US multinationals (Harris and Robinson (2003, Criscuolo and Martin 2009). A key question is whether these productivity gains involve spillovers to indigenous firms. Using econometric evidence across many economies, Gorg and Greenaway (2003) suggest that the case for horizontal (within industry) spillovers is weak at best, and that while that for vertical spillovers is stronger, this requires 'absorptive capacity', i.e. that learning mechanisms must exist amongst indigenous firms. The specific evidence for the UK is also somewhat unclear: the results of studies of spillovers - whether within or across industries or within agglomerations – present a mixed and not always consistent picture with at least some studies suggesting an overall negative impact because the negative effects of competition outweigh any positive demonstration or imitation effects (see for example the survey in Harris 2009). Hughes (2012) points out that the evidence concerning the role of absorptive capacity and the specific nature of spillover effects tend to remain hidden in econometric studies.

Moreover most work in this area has focused on multi factor measures of productivity and not on the question of the impact of increasing multi-nationality on investment decisions. The issue of nationality of inward FDI is therefore of interest. In manufacturing, foreign owned firms accounted for over 30% of employment, having doubled over the previous two decades (Figure 7).

Figure 7: % of Manufacturing Employees in Foreign Owned Enterprise by Nationality



Source: OECD.StatExtracts (accessed 20/3/2013); UK Census of Production 1991; 1991 data for Italy not available

It is perfectly possible that the choice of location for FDI may be knowledge/technology seeking rather than knowledge using, i.e. low productivity firms looking to increase productivity by tapping into a 'reverse spillover' where the gains from capturing spillovers offset higher costs of production. This kind of effect has been found in the literature on geographical clustering where - for example, access to the science base may be important. Specific evidence for UK manufacturing is presented in Driffield and Love (2003), which detects the presence of reverse spillovers in R&D intensive sectors, finding that manufacturing investment by domestic firms raises the productivity of foreign owned enterprise in a way which is geographically bounded. DePropris and Driffield (2006) examine further the question of the role of 'clusters' in influencing the nature of these technology spillovers. They find that inward FDI is unable by itself to create a cluster but that significant two-way productivity spillovers arise from investment activity. The encouragement of inward FDI has long been a central plank of industrial policy in the UK, partly reflecting the possibility that any competitive advantage will help buttress domestic and internationalise R&D and other innovation efforts. The fact that inward FDI may be technology seeking rather than technology deploying, and that spillovers may not be as automatic or as widespread as sometimes believed, suggest that the implications for policy may be more subtle than generally realised.

Looking over the longer-term, variations in economic growth rates between global regions are going to be significant. One set of base-line forecasts sees European growth falling from 1.8% to 0.8% p.a. between 1990-2010 and 2010-2030 against an acceleration of global growth from 3.35 to 3.5% pa, with Asia and Africa forecast to grow faster than that to 2030. Similar difference seem reasonably robust to different policies, with optimistic scenarios raising prospects for Europe no more than 2-2.5% per annum, with eastern Europe perhaps a little faster (EC 2013). This suggest that a further area for policy concern arises from the fact that when trade barriers act as a locational factor inward FDI may put constraints on the geographical destination of UK manufacturing exports. So-called 'export platform' FDI may arise when a multinational perceives Europe as a single market and then decides upon a precise location in a cost minimizing manner. Exports outside of Europe may compete with sales of other affiliates in third country or

home markets. The potential for this effect is shown in Table 7 which contains a comparison of the geographical distribution of various categories of UK manufacturing exports with that of Germany. A baseline case is provided by total exports; it can be seen that the share of exports going to EU-15 was rather higher for the UK, but considerably less to the accession economies, than Germany. This is made up by the share of exports going to North America. If the extent of inward FDI were a constraint on export potential, this might be expected to be reflected in sectors with higher R&D intensity or in sectors where inward FDI is particularly important for exports. As can be seen, there is some evidence for this in the production of motor vehicles, where the presence of the UK in the total of non-OECD economies is far below the baseline, as it is for each of the so-called BRIICS economies (and Turkey and Korea) where market growth potential is commonly regarded as the greatest (EC 2013).

Table 7

% of manufacturing exports in each category by country/region
2008

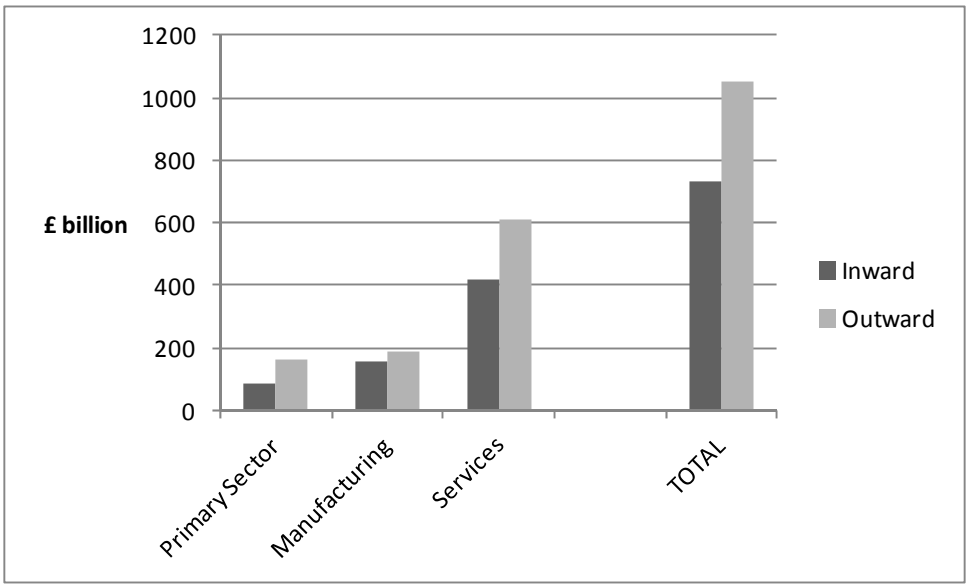
	Total Exports		High-Tech		Medium Tech		Motor Vehicles	
	Germany	UK	Germany	UK	Germany	UK	Germany	UK
EU-15	50.7	51.9	52.0	45.4	44.6	51.6	50.2	56.5
Other EU	11.6	4.0	8.7	3.3	10.9	4.1	11.3	3.8
US and Canada	7.5	15.2	10.4	21.9	9.6	15.1	12.5	12.3
Japan	1.2	1.7	1.7	2.1	1.6	1.8	1.8	1.8
Korea	0.8	0.9	0.9	0.9	1.2	1.0	0.8	0.4
Turkey	1.4	1.0	1.5	0.9	1.9	1.3	2.1	1.5
Total non-OECD	19.1	20.2	20.6	19.1	26.6	19.7	18.4	7.0
BRIICS	8.6	6.9	8.4	5.9	12.0	8.0	8.6	3.8
of which								
Brazil	0.81	0.75	0.88	0.66	1.11	0.97	0.69	0.30
Russian Federation	3.07	1.86	2.69	1.03	3.90	2.66	3.11	2.00
India	0.76	1.29	0.78	1.19	1.06	0.84	0.21	0.09
Indonesia	0.16	0.16	0.26	0.12	0.18	0.18	0.05	0.04
China	3.16	1.89	3.14	2.19	4.78	2.15	3.27	0.82
South Africa	0.68	0.98	0.63	0.68	0.99	1.20	1.27	0.56

Source: OECD (2010)

3.2 Outward investment

For overall FDI, as shown in Figure 8, the UK's cumulative position in manufacturing shows a balance in favour of overseas assets (£192 billion in 2010 compared to £156 billion) although the balance is smaller in proportionate terms than in either services or in primary sector FDI.

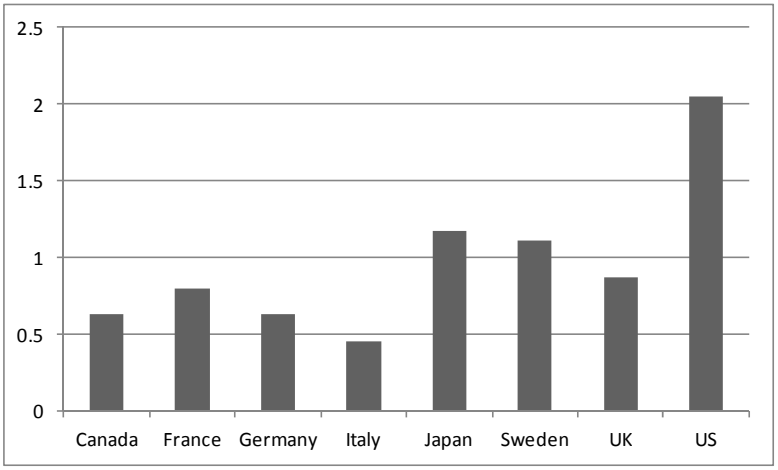
Figure 8: UK FDI positions in 2010



(Source: OECD.StatExtracts)

Firms have a choice between exporting and FDI. The choice made will, alongside other factors, reflect cost structures – high plant level fixed costs will tend to favour exports, while high fixed costs in creating intangibles that can be utilised at low marginal cost wherever the firm locates, will favour outward FDI. An obvious - but clearly crude - comparative measure of the 'propensity' of firms in different economies to substitute foreign affiliate sales for exports is provided by the ratio between the two. Such a measure is illustrated in Figure 9, which shows ratios of turnover generated by outward multinational activity to export sales in manufacturing for a number of economies in our sample where the data were available. This ratio is higher than for the other large European economies but considerably below the ratio in Japan or Sweden and even more below that of the US.

Figure 9: Ratios of turnover of Foreign affiliates in manufacturing to the value of exports in manufacturing (2007-2009 depending on data availability)



Source: OECD.StatExtracts

From the perspective of the home economy, and even assuming full employment, there are important differences between a flow of profits generated through domestic investment and exports, and those generated through foreign affiliate sales. First, there may be an implication for domestic tax paid. Second, even if the choice does not impact on the overall level of employment, there are potentially important implications for the *structure* of employment. The latter point depends on the distinction between vertical and horizontal FDI. For vertical FDI, there is evidence that plants owned by UK multinationals which invested in low wage economies displayed 'lower employment growth than those owned by other types of firm and that this process appears to be primarily driven by lower employment in low-skill industries' (Simpson 2012). Note the trade promoting nature of this form of FDI: outsourcing will increase intra-firm imports, but the improved competitive position of domestic operations should boost exports.

Nevertheless, the bulk of Britain's outward FDI is to the developed economies. Data on establishment in manufacturing operations overseas, suggest the importance of the EU-27 and the US (together taking up over half the world total), but with the faster growing BRICs economies asking up 15% of the world total. Turnover and employment data are perhaps more meaningful, and Table 8 provides a further comparison with Germany in the outward FDI activity of both economies by country and region. It suggests that – compared to their respective domestic bases - that UK manufacturing has a strong presence in the US (which may be important in accessing technology) and has at least some presence in faster growing markets.

In conclusion, both inward and outward investments are important aspects of manufacturing activity. Both form part of what might be called the internationalisation of innovation. The case for inward investment has been made many times but we have noted that it may not be as simple as sometimes supposed. Outward investment represents a pool of significant profitable outlets for innovation and investments which generate knowledge based intangibles at home. Affiliate sales in faster growing markets should be an important source of income for the UK. Much of this will take the form of off-shoring of less profitable activities at home. The potential profitability of such processes should be able to support new investment at home, which brings us back to the question of domestic investment in manufacturing.

Table 8

Outward FDI activity

	Turnover ($ million)		Employees		Turnover per enterprise ($ million)		Turnover per employee ($ million)	
	Germany	UK	Germany	UK	Germany	UK		
World	665,478	277,945	2,158,701	1,038,663	99	55	0.31	0.27
EU27	295,255	80,272	906,994	228,485	96	50	0.33	0.35
US	137,416	99,472	293,590	284,506	157	93	0.47	0.35
BRIICS	212,110	..	991,916	..				
Brazil	113,597	..	517,389	20,908	84	..	..	..
Russian Federation	44,454	3,282	153,165	12,032	197	57	0.29	0.27
India	8,164	10,492	26,041	79,629	76	82	0.31	0.13
Indonesia	8,387	1,302	69,218	12,826	56	30	0.12	0.10
China (exc. Hong Kong)	2,369	5,308	19,879	82,840	62	20	0.12	0.06
South Africa	35,140	12,567	206,224	..	52	103	0.17	..

4. Manufacturing investment and exports

It is not possible to discuss the manufacturing sector without reference to the striking fact that its exports made up well over half (55%) of the total of £371 billion for all exports of goods and services in 2007. This is considerably larger than the combined exports of sectors such as banking and finance (£46 billion), professional and business services (£53 billion) and insurance (£4 billion). However manufactured products have been sharply declining as a share of total exports, by value from 69 per cent to 55 per cent over the period 1992–2007 (roughly the period of continuous expansion in the economy).

While recent growth in service exports has been strong, manufacturing exports will in the future have to take a larger share if, as expected, the finance and related sectors shrink and other trends such as energy imports turn less favourable (Moec and Frey 2006; Coutts et al 2007). Furthermore recent strength in net investment income has owed much to the composition of overseas assets with the foreign capital stock paying twice as much as assets held in the UK by foreigners; this is not however a stable feature of the balance of payments and can change suddenly, making prediction difficult (Weale 2013). NESTA (2010) forecast that devaluation and stronger external demand would on unchanged polices bring the current account into balance, whereas Rowthorn (2009) had previously estimated a continuing deficit of 5% of GDP by 2020. On current evidence, the latter estimate would seem to trump that of NESTA since as yet there has been little trade expansion – by late 2012, volumes of exported goods had grown as compared to 2008 but volumes of services remained lower; as a share of G7 goods exports, the UK has only managed to maintain its share since 2008, after several years of decline (Weale 2013). The disappointing experience of exports (and import competing sectors) since the devaluation suggests a challenge to close the current account deficit through rising manufacturing exports, although the experience of the US and Germany over the last 25 years suggests that it can be achieved.

One problem with a purely export-based strategy is that it has become a game being played by many countries. Just as income multipliers may have risen under general austerity, so the responsiveness of exports and imports to currency depreciation will also have fallen after the financial crisis. Certainly it is hard to discern much improvement in the UK current account following the large devaluation of 2008.

Given the headwinds to export growth and the ongoing deleveraging of private consumers and government, this narrows the base from which demand can be generated. Increasingly, commentators have indentified domestic private investment or public investment as the main likely sources of increased demand in coming years. The McKinsey Global Institute (2012) sees “significant potential for more investment” in the UK, a view based on the larger than average EU fall in private investment since 2007 and also “...the UK’s structural investment gap with its peers.” (p82). A large part of the UK investment shortfall with comparator countries takes the form of residential housing, a point often obscured by the degree of mortgage debt in the UK for existing housing. It may be noted that housing final demand exerts a significant pull on the output of the manufacturing sector in the UK. Others such as Financial Times writer Martin Wolfe have argued for a debt-financed expansion of public infrastructure which would also be intensive in manufacturing input. In this section we consider what advantage to exports there might be in a greater share of manufacturing output devoted to investment.

Would a boost to manufacturing investment be a good policy for increasing exports, output and employment? The usual approach to answering this question is to use large sector-specific models with input-output features and to shock the model with some assumed driver such as higher productivity or increased demand. For example, the UKCES (2011) report on rebalancing the economy uses baseline projections from Cambridge Econometrics with simulated variants. One simulation comprises a “dynamic” scenario where the share of manufacturing output is restored to its early 2000s level by 2020. Similarly NESTA (2010) has used a baseline projection from Oxford Economics, supplemented with scenarios that boost manufacturing (either general or high-tech). Both sets of models show that, with unchanged policies, the share of manufacturing employment will continue to fall in the decade to 2020 with manufacturing employment falling by between 140,000 (Cambridge model) and 550,000 (Oxford model).

Under the “dynamic” scenario in the Cambridge model, manufacturing jobs increase by about 100,000 in the ten years to 2020 with the share of manufacturing output in the economy rising by two percentage points. The corresponding general boost to manufacturing in the Oxford model envisages a scenario in which half the gap with Finland and Germany in manufacturing’s share of output by 2020 is closed, but this is regarded as infeasible since it requires manufacturing output growth in excess of 6% a year and the creation of 300,000 extra jobs. A further alternative considers a boost to high tech manufacturing - to match these countries’ shares in those industries. While this is seen as more realistic, it actually leads to a *fall* in manufacturing employment of 300,000.
As can be seen there is a wide range of possibilities reflecting different assumptions and model methodologies. Here, we approach the question slightly differently from the narrower perspective of the effect of increased manufacturing investment on the economy. Since such a large proportion of manufacturing output is exported, the main interest is in the effect of increased investment on exports - which can then be expected to feed through with multiplier effects to output and employment. We concentrate on that effect, although there are other effects which may be important. These include the boost given to import competing domestic firms within manufacturing and, on the demand side, the boost given to the engineering and construction sectors of the economy through rising sales of machinery, equipment and materials.

The impact of investment on exports comes through two main routes. On the one hand, investment is likely to reduce unit labour costs in UK manufacturing compared to its competitors (relative unit labour costs or RULC) by increasing its relative productivity. On the other hand, there may be a further effect operating through channels which reflect the impact of technological activity on product innovation and quality and hence on exports. This latter channel has perhaps been less well studied, but the importance of ‘technological competitiveness’ for international trade amongst the OECD economies has been established by Fagerberg (1988) and replicated in later studies. Empirical exercises relevant to the UK include Greenhalgh (1990), Buxton et al (1991), Greenhalgh et al (1994), Swann et al (1996), Carlin et al (2001) and Barrell and Pomerantz (2007). The study by Carlin et al of export market shares is particularly germane in that they explicitly consider the share of manufacturing investment in value added (normalised by the relevant industry average across the 14 economies) as an explanatory variable operating over and above any impact of investment on RULC. This measure was seen by the authors as out-performing other proxies for technological competitiveness considered – patent and R&D shares. We do not find this surprising. The significance of investment does not reside in the capital equipment as such, which is typically available globally on competitive terms (Aghion 2006), but on the ability of firms to translate their own

capabilities and technical advance more generally into profitable investment projects. Others therefore see capital investment as an indicator of the diffusion of innovation and argue that innovativeness is embodied in capital investment, at least outside of the most advanced sectors (Evangelistia 1999; Hughes 2008). This view therefore regards capital as 'special' in that it is not subject to the usual diminishing returns but rather is a carrier of innovative potential that creates spillovers and invites replication.

We can make use of the estimates of the elasticities provided in Carlin et al to illustrate and compare the impact of an investment-led policy which operates on exports via both channels (call it policy 'I') with a 'traditional' policy (policy 'T') which operates through exchange rate depreciation or slower wage growth in the domestic economy.

First consider policy T impacting on RULC. The long-run elasticity of export market share to RULC is estimated by Carlin et al to be -0.29. Note that the change in export market share is invariant to the precise source of any change in RULC (whether through changes in relative wages, exchange rate movements, or changes relative productivity). Note also that as this is a value share of exports, this figure is considerably less than a conventional price elasticity operating on the volume of exports. With full pass through of a fall in RULC on prices in foreign markets, this would correspond to a price elasticity of -1.29 but with a 50% pass through it corresponds to the commonly accepted estimate of -1.5 for the UK (see for example Hooper et al 2000; Imbs and Mejea 2010). However the UK manufacturing sector has seen significant changes since the sample period covered in the study, including and, as we have seen, with increased multinational presence in trade (much of it intra-firm) conducted in ways that might be expected to reduce the pass-through and result in firm's profitability being affected instead. However, if policy T results in a 10% fall in RULC – the resultant boost to the export share with an elasticity of -0.29 would be around 3%. With a benchmark figure for UK manufacturing exports of £200 billion, the estimated long run impact is for an increase in exports of £6 billion.

The investment-led policy I also of course impacts on RULC by raising relative productivity levels. Suppose the policy were to raise UK investment shares in manufacturing value added (currently about 0.10) to 0.16 (see Table 1) - roughly the rate of investment observed (for say) France. Even in the standard case in which there no impact on long-run growth, the rise in investment share to 0.16 may be expected to raise the long-run productivity level in the range 8-10%. This is compatible with both the estimates in McKinsey Global Institute (2012) discussed earlier, as well as with comparisons of relative sectoral productivity levels described in Inklar and Timmer (2008) whose data suggest that the bulk of the labour productivity short-fall between Britain and France in manufacturing of about 14% is due to capital inputs rather than multi-factor productivity. A central estimate of the rise in relative productivity of 9% would give a boost to exports of £5.4 billion. But policy I also operates through the channel of technological competitiveness. The same rise in investment shares would – given the estimated coefficient of 0.0157, imply a rise in the *logarithm* of export market share of (0.05/0.16) * 0.0157 or about 0.6% increase in the export share, worth an additional £1.2 billion. The combined impact of the two channels of policy I - £6.6 billion - would therefore be rather greater than a 10% decline in RULC achieved via devaluation. The comparison between the two policies is summarised in Table 9.

Table 9

Impact of Alternative Competitiveness Policies on UK Manufacturing Exports[1] (£ billion)		
	Traditional Policy (T)	Investment Led Policy (I)
	10% devaluation	Increase in Investment to 16% of value Added
Impact via Cost Competitiveness	6	5.4
Impact via Technological Competitiveness	0	1.2
Total	**6**	**6.6**

[1] Based on Estimates in Carlin et al (2001) and UK manufacturing exports in £200 billion

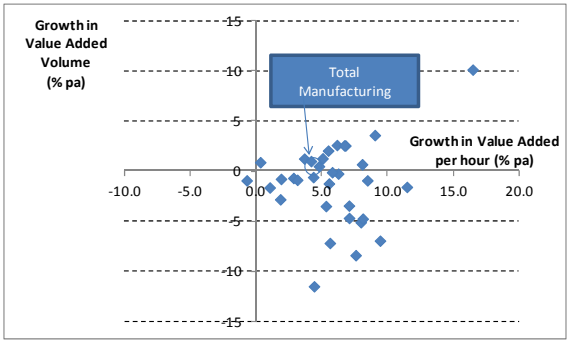
A note of caution does however need to be added regarding the impact of such policies on the balance of payments itself. As emphasised by Coutts and Rowthorn (2009), the impact on the balance of payments arising from the rise in exports will inevitably be reduced because of the high import content of manufacturing activity. However this effect will be counter-balanced by the competitive effect of rising productivity in import-competing products and sectors.

The comparison between the alternative policies relies heavily on other factors remaining constant. Moreover, in the Carlin et al study, it makes no difference which of the sources of variation in RULC operates; the long-run impact on export market share is the same. However, that does not mean that the three routes are equally possible, desirable or sustainable. Monetary Policy Committee member Martin Weale (2013) noted in a recent speech that while productivity increase may not be achievable, wage reductions may cause higher real interest rates and falling domestic spending while the exchange rate effect appears to operate only with a long lag. Of course, from a long-run perspective such as we take here, a long lag is not the issue – we are more concerned whether the effect identified by Carlin et al remains a robust one. The response of the UK export share to the steep devaluation of 2008 (even if some of that has by now been reversed) is not encouraging for manufactured goods where there appears to have been little response to the competitive advantage offered. And while economic theory can show that long waiting times are justified under uncertainty, for many manufactured goods the sales connections are already in place so that one cannot rely on the explanation of discontinuous set-up costs to explain the poor response. It may be that the price elasticity of exports has in fact been altered in recent years by the movement up-market in manufactured products and perhaps also by the increased international presence of foreign firms which may have reduced the extent of arms-length market transactions.

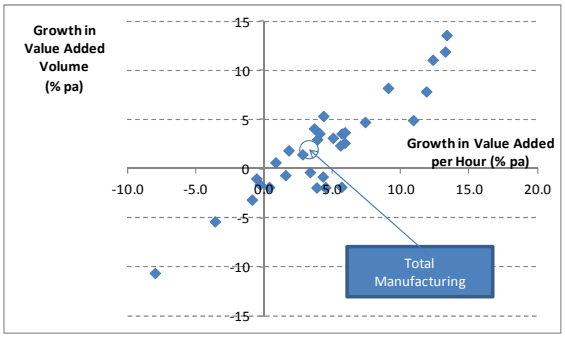
There is also a general question of the sustainability of the three separate channels of influence of RULC. While competitive devaluation can give a breathing space, this may not be sustainable unless the improved profitability of exporting is reinvested in new capacity and improved productivity. The same may be true of a policy of relative wage reductions unless complementary policies can prevent associated falls in relative

productivity. In our view, the investment- led strategy for rebalancing the economy represents a more promising dynamic alternative to conventional competitive devaluation and/or wage restraint and whose impact on productivity levels may in fact lead to longer-run increases in productivity growth rates, not least because the strategy is more directly linked to the development of individual firm level capabilities. However as part of such a strategy, it is essential that virtuous cycles in which productivity growth feeds into output and employment growth are encouraged. In Driver and Temple (2012) we investigated the well-known relationship between output growth and labour productivity growth across industries in the UK, distinguishing between two periods, the 1979-1990 business cycle, compared to the longer cycle 1990-2007. While the former cycle was confirmed as showing a strong positive relationship in manufacturing - echoing what Oulton and O'Mahony (1994) had shown for earlier post-war periods 1954-1986 - this relationship seems to have broken down – as shown here in Figure 10 for the most recent 'pre-crash' period 2000-07 where we find a large number of industries combining substantial productivity growth and negative output growth. This is in sharp contrast to Germany (Figure 10(b)), where the relationship has continued to assert itself. There are of course multiple interpretations for what is clearly a two- way relationship, but substantial productivity growth in absence of output growth suggests that one part of the UK story is that investment opportunities made possible by the productivity growth itself are not being taken up. By contrast we can compare with the case of Germany, Why might this be? Next we consider the determinants of investment.

Figure 10 Output and productivity growth in UK and German manufacturing (2000-2007)



(a) UK 2000-07



(b) Germany 2000-07

Source: (EU KLEMS 2009 edition; 2011 update).

5. Manufacturing investment: determinants and constraints

A number of reasons may be advanced for a relatively low rate of capital investment in the UK (DTI 2003). In this section we focus on the standard issues of general business conditions and finance, going on to consider a simple model of manufacturing investment before looking at other influences.

5.1 Business confidence, uncertainty and macroeconomic instability

The general business climate in the UK has been seen as favourable to enterprise in recent decades (Card et al 2004). Given this, the poor performance of UK investment is hard to explain. Sir John Gieve (2006) when Deputy Governor of the bank asked how a reduction in macroeconomic volatility, an historically high ratio of financial surplus to GDP and unprecedented low borrowing costs could be consistent with the lowest whole-economy investment spend since the 1960s.

Uncertainty could still be a factor. While the 'great moderation' period in liberal market economies since the 1980s has reduced inflationary swings, it has not led to a lower amplitude of the business cycle as evidenced by the severe downturns in the UK in the early 1980s, the early 1990s, a growth slowdown in early the 2000s and the period post 2007-8. Furthermore, although the period since 1980 was characterised by longer lasting macro-cycles, firms operate in individual micro-markets where one firm's flexibility is another firm's volatility (Temple et al 2001). The exchange rate too has been unusually volatile in comparison with some other countries (DTI 2001); evidence shows that transitory volatility deters investment (Darby et al 1999; Byrne and Davis 2005). The UK investment response to global uncertainty since the late 1990s has arguably been even more cautious than in comparator countries as the world imbalances grew and as the option to wait increased in value.

5.2 Profitability and Financial constraints

Business conditions reflect the prevailing rate of profit and its share in national income. These have been upwardly trended since the 1980s, though for manufacturing the rate is lower, in keeping perhaps with the higher reliance on loan finance, which lowers the cost of funds. Earnings of non-financial companies have remained surprisingly resilient throughout the financial crisis. Nevertheless, some companies find it hard to access external capital. There is also an acknowledged long-standing first-round finance gap for companies seeking finance within bands from £250k to at least £2m and possibly up to £15m where R&D is involved; additional concerns exist for follow-on funding (BIS 2009). There is continuing controversy over the extent to which the subdued level of bank lending is due to firms being credit rationed or due to their own inherent caution in the face of uncertain demand. Reviewing the UK and European evidence, the McKinsey Global Institute (2012) concludes that the "cost and availability of financing appears to have had only a secondary role in the recent reduction of investment" (p.21). This is consistent with the views of the Breedon Report (BIS 2012) and commentaries in the Bank of England inflation reports and credit conditions surveys.

5.3 Modelling and estimating investment

Investment is difficult to model accurately because it depends on expectations. There is no encompassing model of investment in the literature and existing models all suffer from structural breaks (Rapachi and Wohar 2007). Comparisons across countries are hampered by the fact that there is no statistical breakdown of business investment by asset class. The last major study of comparative investment by asset class is to our knowledge IMF (2003) which used non-residential fixed investment to make comparisons with 20 other OECD countries. The main finding of that study is consistent with the evidence in section 2 above that the UK is an outlier in terms of weakness in total fixed investment and construction investment in particular. However, for equipment investment, the UK is comparable to other OECD countries. The construction pattern is not explained by any set of additional variables used in the IMF study. However, the explanatory power of the equipment investment equation is improved by including, along with country dummies, relative cost of loan finance to wage rates and a proxy for labour market flexibility that exerts a *negative* effect on fixed investment.

The pattern of weak construction investment in the UK is consistent with the evidence in Driver et al (2005) showing a negative trend in the co-integrating relationship for fixed investment in structures over many decades. Such a consistent feature of UK investment (which pre-dates the big recent decline in manufacturing) is hard to explain by existing theory. It may reflect an acculturation to short-term decisions and reluctance to take big irreversible decisions. A preference for cost-cutting over expansionary investment has been noted as feature of UK industry by Bank of England officials (Lomax 1990).

5.4 Investment since 2007

Investment in most OECD countries has been constrained by the fall-out from the financial crisis but the UK has, in keeping with its historical record, seen investment fall by more than other economies. Gross Domestic Fixed Capital Formation (GDFCF) fell as a proportion of GDP fell between 2007 to 2012 from nearly 18% to just 14%, a similar fall to that of the US, but rather larger than other G7 economies. In volume terms GDFCF in 2012 was still just 84% of its level in 2007 (OECD 2013). Total business fixed investment has held up a little better and was around 92% of its 2007 level in 2012. For manufacturing, the period has been somewhat bleaker than business investment, with fixed investment falling to 79% of its 2007 level in 2010, before recovering to 89% in 2011 and remaining at that level in 2012 (ONS 2013). Internationally comparable data under the new manufacturing classification remains patchy, but data for Germany suggest that by 2010 manufacturing investment had recovered to 84% of its 2007 level and 94% in 2011 (OECD 2013a).

The Bank of England estimates that total business investment remains around 20% below where it would have been had it continued to grow at its pre-2008 average rate. If investment had continued along that path, then under plausible assumptions, there would, on average, have been at least 5% more capital for each private sector employee by 2012 Q3. (Inflation Report February 2013). Set against that loss, the projections for investment growth over the next few years look modest. The OBR forecasts at the end of 2012 was for about 10% growth in business investment by 2015-16 but this has been halved by new estimates in the British Chamber of Commerce (March 2013) while the IFS (2012) expected business investment to be running at between 6% a year up to 2016. For manufacturing the CBI indicator for January 2013 while positive is indicating

only modest recovery ahead for investment. Not only is investment low at present but detailed information for manufacturing available from the CBI ITS survey reveals a marked shift towards replacement investment and away from both expansionary and cost-saving reasons for investment. The lack of expansionary investment is alarming as it cannot be explained by low levels of capacity utilisation. Indeed capacity utilisation in manufacturing has now risen to a higher level than its average between 2000 and 2007 (Bank of England Inflation Report August 2012 Chart 3.9, p.30). Other estimates of capital utilisation from the BCC and the Bank's regional agents support this view of capital constraint (IFS 2012).

To assess the importance of uncertainty and financial constraints we carried out a small econometric exercise for UK manufacturing plant and machinery expenditure, noting any change in behaviour since the onset of the financial crash. Using an update of the model in Driver (2007), we estimate investment in a two-stage process that first explains variation in firms' optimism and second, models investment as conditional on optimism. Our estimates use data from the CBI Industrial Trends Survey, disaggregated by size and updated to 2012.[3] The two size categories that we distinguish here are (1) Small firms: these are firms with between 10 and 200 employees. We contrast this with a set of larger firms between 500 and 5000 employees. The "small firms" group arguably contains some medium sized firms since this group is often defined with an upper bound of 250 employees. The category of "large firms" excludes medium size ones on any definition, but we have also excluded the very largest firms (>5000 employees) on account of a much higher random component due to sampling error.

The estimation results show that firms' optimism is well explained by future expected output and past output, the real interest rate and a general measure of uncertainty. Investment then can be explained by optimism and an additional variable for external financial constraints. We use survey data on financial constraints, though these data need to be modified to take account of the fact that such constraints are cyclical. From the CBI industrial trends survey it is clear that external finance availability is normally a minor influence on investment compared with demand, internal finance or cost of funds but in 2009 it briefly rose to eclipse the others except for demand and still remains much elevated compared with the cost of finance. Our view is that some external financial constraints work through the financial accelerator process, as where financing is restricted to firms with poor collateral and such collateral falls in value in a downturn.[4] We are interested in identifying financial constraints that operate independently of this e.g. through bank decisions on lending that are related to their lending model, capital requirements and so on. To facilitate this we removed the cyclical element to financial constraints by regressing the financial constraint variable on capacity utilisation for each size group and using a normalised version of the residuals as a transformed constraint variable. The output of the resulting investment equations can then be interpreted as reflecting a cyclical effect of business optimism and an effect due to change in lending policies of banks of other suppliers of corporate funds. In the results presented, optimism has been endogenised using the determinants found in a first-stage regression of optimism on expected and past output and real interest rate.

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[3] We are grateful to the CBI and to Jonathan Wood, Head of the CBI Survey Management Group, for access to these data and for permission to use them in our estimation; also thanks to Jair Muñoz-Bugarin for econometric assistance.

[4] Firms may report being constrained by external finance but may really be self constrained in that they are aware that borrowing without collateral would be undesirable. The Bank of England Credit Conditions survey shows how difficult it is to separate out supply and demand aspects of financial constraints.

To present the results we show rolling regressions that give the investment coefficients on optimism and finance over the last fifteen years of the timeframe.[5] These are given in Figure 11 with two panels each for the small and the large group.

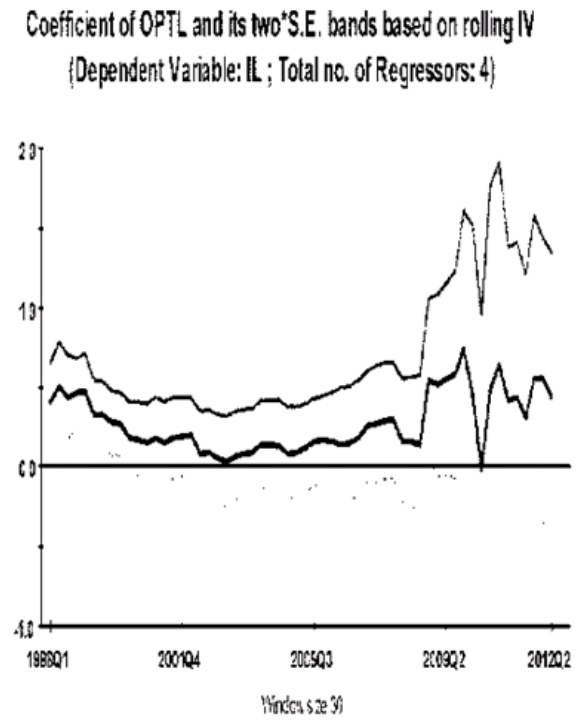
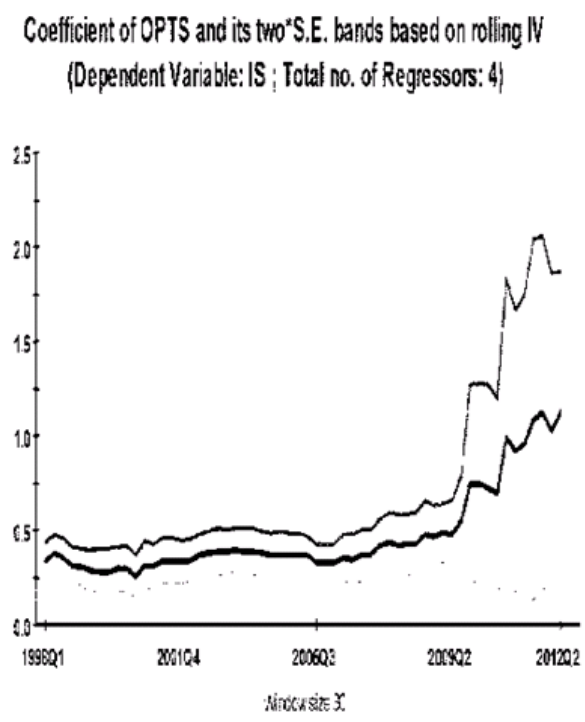
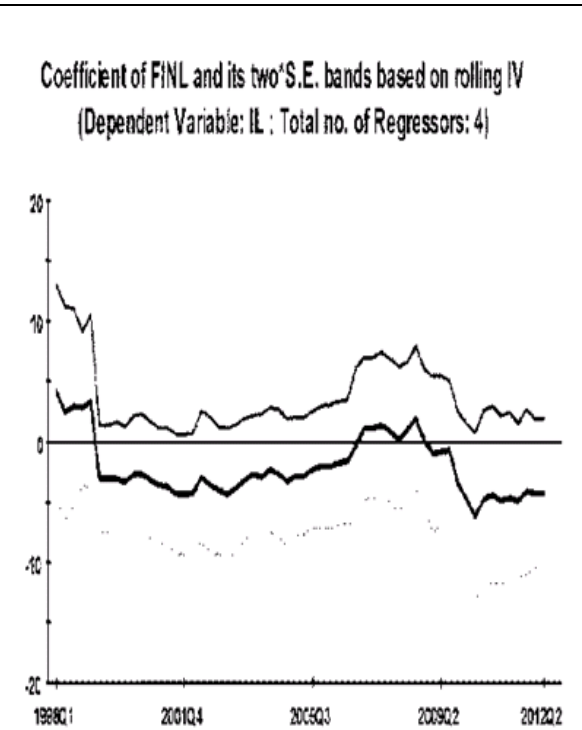
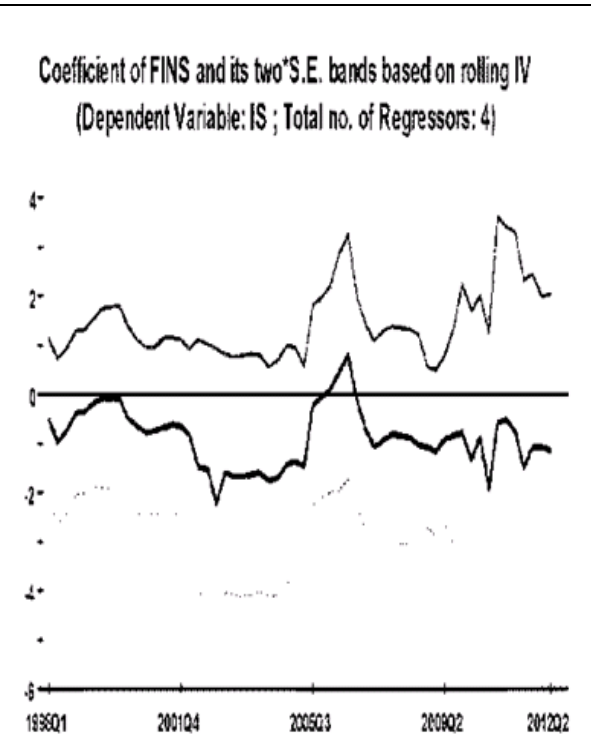
Figure 11, panels (a) and (b) show the response of investment to optimism by large and small firms and how that response changes over time. For large firms the responsiveness to current optimism seems reasonably stable over the period up to the onset of the crisis when investment became much more sensitive to optimism but also less well determined. This will have resulted in a highly - - volatile investment climate. The elevated coefficient indicates a readiness to respond positively and rapidly when conditions improve (as they did in 2010) but the wider confidence band suggests that the response is less predictable and likely to be unstable over the period. For the small firm group, the response to current optimism is generally stronger over the whole period, reflecting perhaps the connection between small size and flexibility. After the financial crash of 2007 the response is elevated sharply, but again widening confidence bands highlight the volatility of the coefficient.

The next two panels (c) and (d) show the response of investment to (the non-cyclical component of) external financial constraints. For the large firm group, there appear to be two step changes in the response to financial constraint. The first increase in the negative coefficient comes around the time of the dot-com crash and is to some extent reversed by the time of the onset of the financial crash of 2007 by which time banks and investors were more readily supplying credit and finance. From 2008, the large firm sector shows a pronounced response to finance constraints with the coefficient becoming more negative than at any time in the sample. It should be noted that the large firm sector will experience financial constraint not just through relations with banks but also in terms of the ease with which capital can be raised through bond issuance and equity. Following the crash there was a significant increase in share issuance by companies to repair balance sheets; companies may have reported their need to seek out alternative sources of finance as a constraint. On the basis of these results it would be wrong to suggest that the large firm sector is immune to financial constraints, a finding also confirmed also by the Bank of England credit conditions survey, though the effect on investment is now less than in 2010.

The small firms' coefficient on financial constraint is negative as expected and close to conventional significance levels from around the period of the dot-com crash. As with large firms, this was reversed in the run up to the financial crisis of 2007 but returned to previous levels afterwards. The pattern here seems to confirm this sector as one that is used to living with financial constraint and contrasts somewhat with the large firm sector in that regard.

[5] Using a rolling window of 30 quarters with estimation step of 1.

Figure 11 Rolling Regressions of Investment on Optimism and Finance: Large and Small Firms

Panel (a) Large Firms Optimism Coefficient	Panel (b) Small Firms Optimism Coefficient
	
Panel (c) Large Firms Finance Coefficient	**Panel (d) Small Firms Finance Coefficient**
	

What do these results tell us overall? First, finance can matter for both large and small firms. Since the onset of the financial crisis, large firms have been affected by external finance to an unusual extent. For small firms, the current situation does not seem totally different to that which prevailed before the financial crisis, *once the effects of the severity of the cyclical downturn on demand is factored in.* With regard to the response to optimism, the wider confidence bands and instability in the coefficients suggest that long-run confidence will need to be established in some general way before investment is likely to resume.

As our large firms do not include the very largest we cannot say anything definitive about the so called cash piles accumulated by firms in the aggregate. For our sample of firms above medium size there appear to be some continued constraint on accessing external funds, though this may coexist with other firms having a large cushion of liquid assets. Subdued M&A activity may be one explanation for a co-existence of liquid assets and reported constraints as firms hoard cash to confer options for future takeover activity, for which an upturn will normally require asset prices to bottom out.

5.5 Other influences on investment that might explain comparative performance

Formal models cannot always accommodate important influences either because they cannot be readily codified or because the data is inadequate. Among the additional variables that deserve consideration are the following.

1. **Corporate taxation.** Corporation tax receipts as a proportion of national income for the UK are about at the OECD average. The UK percentage of national income raised by corporation tax has been driven up by financial sector profits since the 1980s despite reductions in the marginal rate but receipts are now under pressure from lower returns from the financial sector and accumulated losses elsewhere, so that the share of corporate tax in national income is set to fall back in the next five years to the lowest level since the mid 1980s (IFS 2013). Without a detailed panel model of firms it is hard to estimate the effect of corporation tax rate on fixed investment because the effective rate of taxation differs from firm to firm and asset to asset. Nor is it easy to estimate the distorting effect of corporate tax in driving investment abroad because an indeterminate amount of tax avoidance takes place. Young (1999) obtained a significant effect on UK fixed investment from the comparative tax rate on retained profits, but only for some time periods and only with the US as comparator, not other OECD countries, while Driver et al (2005) found no long-run effect for UK corporate taxation on aggregate investment for any asset class. It may be noted that the share of fixed capital in GDP has moved oppositely to the private sector *net* rate of return since the 1980s, suggesting that corporate taxation is not the driving influence on the investment share.

2. **Excess Capacity**. UK manufacturing has tended towards a lower amount of spare capacity in recent decades, whether because of technological factors or a lower concern for the effects of non-supply (Driver and Shepherd 2005). Indeed since the 1980s, shortage of capital has overtaken shortage of skilled labour as the main supply constraint in CBI surveys. Of particular note in the current period is that the CBI indicator of utilization in manufacturing is now at about the same level as it was in the much shallower growth recession of the early 2000s.

3. **Excess Leverage**. For a variety of reasons, leverage can be shown to have a negative effect on capital investment: because of the impact of leverage on shareholders if risk is properly priced; because of managers' fear of default; because of liquidity constraints due to higher debt payments (Cuthbertson and Gaspero 1995). Bank of England research shows that the growth of private equity has raised leverage, especially for large buy-outs in the last two decades so that private equity accounts for 5% of UK assets but 8% of debt. While there are positive arguments for private equity's lower agency costs, others worry that that the model leads to "short-term decisions to hoard cash flow, cut costs (including investment) and raise prices in order to allow a quick sale at a profit." (Gregory 2013 p.41). Whatever the outcome of this debate, the proportion of private equity in the economy is not large enough to drive the results of long-term lack of investment. Nevertheless, the high levels of leverage that UK experienced in the last two decades - which companies were attempting to pay-down in the period before the financial crash - may have exerted a drag on investment rates.

4. **Public infrastructure and competition**. The UK has a well-developed and prestigious university sector and good legal protection for investors. It has one of the highest penetration rates of internet access of OECD countries. Set against these positives, there are deficiencies in public transport and energy infrastructure. International comparisons are difficult but OECD sources show government expenditure on investment was lower as a percentage of GDP for any G7 country for the period 1980-99. (DTI competitive indicators 2nd edition). Since then public investment as a share of GDP has remained low at about one half the average of the EU or of the OECD (OECD 2012, p.131).

   There seems to be a dearth of evidence as to the effect of public investment on productivity and thus on the stimulus it provides for private investment – the DTI (2003) noted it's importance but reported that there was no quantitative evidence (p.40). Public infrastructure such as transport and communications is particularly important for the intensity of competition. The intensity of domestic competition will have been reduced in recent years as UK manufacturing increasingly withdrew into niche products. Competition from similarly placed rivals is an important feature in ensuring that firms bring forward projects that are profitable but would otherwise be with-held because they might depreciate some other asset (Driver and Temple 2010).

5. **Skills and management failings**. Here we focus on the specific question of management skills. While many large companies will employ highly qualified management cadres we have noted that, overall, manufacturing employs relatively fewer managers who are educated to the highest level. The end result may be a cycle of low productivity and weak signals to invest. But even where the signal to invest is strong it may not be recognised or acted on if management skills are lacking. As noted in Davis et al 2012 (UKCES Report 48) ... "no justification for capital or revenue will succeed without the funder being confident that the company understands its drivers of change and has reasonable prediction mechanisms for judging and controlling the financial return on any investment" (p.24). This is even true where a project is seeking internal funding and where the board has to be sure of its own managers' expertise. While most companies may have staff who understand discounting and accountancy issues, it is much less likely that SME firms are comfortable in quantitative issues relating to forecasting cash flows, dealing with variable cash flows, envisioning real option values or handling sensitivity analysis and

risk metrics. While we are not advocating the use of any particular method, a familiarity with quantitative methods and advanced decision analysis often gives an insight into complex and apparently unquantifiable choices allowing them to be addressed confidently rather than being dismissed as too risky. Indeed the McKinsey Global Institute (2012) has highlighted the depressing effect on investment of this "bias against risk [whereby] ...managers add an arbitrary 'risk premium' on top of the agreed cost of capital in an attempt to 'compensate' for risk" (p.9).

6. **Finance, Short-termism and Corporate Governance.** The required rate of return on investment (or hurdle rate) often seems inexplicably large in the UK. The hurdle rate comprises an estimate of the project cost of capital and a premium that firms often apply for various reasons – some good, some bad. Firms may use a higher discount rate than the theoretical cost of capital if they fear that financial institutions are short-termist or more simply the users of finance may themselves favour short-term projects over longer term ones. Empirical work by Bank of England economists claims to have identified short-termism as growing in importance in the UK in recent years, though the test they used was effectively a joint test on that and the specific model employed. Perhaps most convincingly, a series of qualitative studies over many years (surveyed in Driver and Temple 2012) points to short-termism as an endemic problem for the UK. More recently the Cox (2013) report has demonstrated widespread agreement - by employer organisations and trade unions - on the existence of a continuing problem.

High hurdle rates are closely related to the issue of corporate governance. The effect of corporate governance on investment is generally viewed in terms of the principal-agent model in which owners need to ensure that the managers' incentives are aligned with their own, or that that managers are monitored closely. One purpose of this is to lower the cost of capital for well governed firms and to ensure an appropriate supply of funds. In terms of the supply of equity finance, the net flow of equity funds to non-financial corporations has been negative in recent decades both for the US and UK. In this context, the importance of good governance is seen as more to do with the proper allocation of finance, so that it is not wasted or misappropriated in ventures of doubtful value. Some have questioned whether this last task is efficiently managed by the governance system that characterises liberal market economies. This is because the ownership of shares is dispersed, creating a free-rider problem in the monitoring of management, encouraging investors to use 'exit' rather than 'voice'. An emphasis on liquid stock exchanges with the freedom to sell at short notice may result in a shortening of the time horizon for returns that managers feel compelled to accept. This short-termism becomes a serious issue when there is a high degree of information asymmetry between managers and owners so that the former find it difficult credibly to convey to the latter the wisdom of long-term investment plans. Asymmetry also makes it difficult to design compensation systems that cannot be gamed by senior management.

6. Policy issues

A great many influences on manufacturing investment and performance have been identified in previous sections. Here we make a judgement in selecting a limited number of issues to discuss further. We deal with the topics of business confidence; competition and access to finance; management and technical skills; corporate governance and financial short-termism; and institutional supports for change.

6.1 General business conditions: the need for coordination

Increasing globalization and the increasing internationalisation of the UK manufacturing supply chain, a process enhanced by big increases in foreign ownership, have led to increasing numbers of calls for an industrial strategy, from both labour and employer organizations. The Manufacturing organisation EEF (2012) for example, has campaigned for a modern industrial strategy that is concerned with such issues. As part of the strategy they argue for more globally focused companies expanding their footprint in the UK and not offshore. The kind of industrial strategy envisaged by the EEF and others requires sustained and coordinated intervention that will only be guaranteed by institutional support.

In our view the concept of manufacturing retains its usefulness for describing a set of industries that encompass a dense nexus of vertical and horizontal linkages with the potential for collaboration. This warrants a strategic oversight body for manufacturing as a whole which cannot be achieved by a range of free-standing organisations - however clear their purpose. There is a need is for an overarching policy institute – inclusive but not limited to *Foresight* - that is tasked with industrial regeneration and with coordinating the many excellent but fragmented contributions to manufacturing competitiveness, such as the staged process of commercialisation of technology envisaged by Hughes (2012).

6.2 Finance

Access to finance is important not just in terms of any direct growth it facilitates but also in the competitive spur that it gives to established business. That is why, arguably, the issue of follow-on finance where medium sized firms can challenge much larger ones is important. This issue is likely to be of increasing importance as Banks continue to strengthen their balance sheets. BIS (2012) while recognising some credit supply constraints on SMES did not think that banks were acting irrationally so there may be limited scope for simply easing capital requirements. There is renewed interest in opening up opportunities for SMEs to access sources of finance other than banks, especially in the light of a forecast five year funding shortfall of nearly £200b identified by the OBR in 2012, about a third of which would be required for SMEs. Peer to peer lending and regional funding sources may help. Many useful recommendations in BIS (2012) include pooling SME loans and a better public advice function. Beyond these fairly modest steps there are possibilities for new public agencies. It should not be forgotten that the National Enterprise Board played an important role in the provision of start-up finance in the 1970s and 80s. While there are now many more private sources of finance than then, the fact that it had a better success rate than modern venture capital funds is of interest (Yong 2002). However, as pointed out earlier the main financing gap today may be with follow-on finance for established companies.

6.3 Technical and management education

Technical education is an area where by common consent the UK has made less headway than in third level academic education and this may hold back private investment (Barker 1999). Firms may not invest in advanced equipment where they have to bear training costs and face poaching. Individuals will not want to invest in expensive training if the diffusion of advanced equipment is slow. In that context it may make sense to internalise the externalities and encourage the ownership of technical colleges by the owners of capital goods. This would incentivise them to produce highly qualified students. The benefits from selling courses and capital goods would be internalised in a way that should lower the price or increase the quality of both, while the greater pool of trained workers would reduce the fear of poaching. The latter issue could also be addressed by introduction of training levies.

Other ideas include public financing of option payments to equipment providers expiring at a variety of future dates chosen by the purchasing firm. These payments would be conditional on the equipment suppliers providing advance training programmes in house for the purchasing firms. Firms that do not exercise the options would be obliged to pay back a portion of the subsidy at a rate depending on the state of the economy when the option expired, so that firms with no prospects of realistic return on the investment at the point of expiry (due to poor macroeconomic conditions) would not be heavily penalised or would be allowed to roll the options over. To prevent the deadweight loss due to equipment firms collecting option payments on purchases that would have gone ahead anyway, the option payments should be rationed, thus allowing the equipment suppliers to focus attention on sources of new orders (though they will also have to bear in mind the hazard of customer failure). The overall effect should be to induce new linkages between supplier and users and to increase the volume of training on advanced equipment. A merit of the scheme is that it makes heavy use of the information stock of both buyers and sellers of capital goods with the latter acting as monitors in respect of the use of public funds. A further merit of the scheme is that it is automatically limited in duration (through the design of the option arrangements) and so will not contribute to future policy complexity.

Of equal importance to technical education is managerial education to prevent poor decision making such as a bias against risk in the procedures by which SMEs gauge investment. Just as construction has seen large savings over the years by learning how to eliminate excessive safety margins in building regulations, the same is true with financial decisions for non financial corporate enterprises. Managers often suffer from loss-aversion, a feature that is accentuated where crude performance targets take no account of whether failures are due to uncontrollable factors. Managers of large companies are often judged on divisional performance where much of the success or failure occurs at sub-divisional level and requires a more granular approach to decision making (McKinsey Global Institute 2012 p. 47-8).

6.4 Corporate governance and firm growth

A central task of good governance is to provide a solution to the problem of asymmetric information under which shareholders know less than managers. But there is considerable debate on how to achieve this. A defence of the status quo is that short-termism is inherent in a world of liquidity. High Dividend cover and/or high leverage are mechanisms to discipline management and their application may inevitably entail short-

termism. Against that there are at least three countering views that will be labelled here as *Kay; Myners II; and Bottom up Governance*.

(i) The *Kay Review* (Kay 2012) argues that short-termism is made worse by the intermediation system whereby institutional investors manage or subcontract the managing of their funds. The cost of this intermediation is deemed excessive and the process is distorted by a principal agent problem that arises between the owners (of pension funds etc) and the traders whose compensation is judged by a short-term yardstick. A solution will in this view depend on an acceptance of a fiduciary role by trustees and others, and incentives to support long term decision making. The Kay perspective, then, seems to blame short-termism on the financial sector. This is the same view that Hatsopoulous et al (1988) initially took in the United States because they could not see why short-termism would otherwise not be corrected by hostile takeovers by long-term investors. Later, however the same group revised their analysis so that it was the hurdle premium over the cost of funds that needed to be explained (Poterba and Summers 1995). Cox (2013) follows the same line as Kay but has additionally proposed radical remedies such as taxation of equities, changes to reporting requirements and the corporate governance code, improvements to the AIM market and changes to takeover law.

(ii) Myners II (so labelled because Lord Myners (2013) has significantly modified his views since his previous report on finance and governance in 1990), takes a more radical line. He argues for concentration of ownership – holdings of 10-15% - and more active investors. He proposes to reform the system of institutional investors so that they are closer to companies and argues that they should choose directors. He sees advantages in two or three pension funds – for whom liquidity is not an issue - owning private businesses. To this he adds a battery of other proposals such as an investor forum, a Tobin tax, stricter conditions for takeovers, and more employee ownership. However Myners admits that “most of our institutions do not want to be insiders” and thus it is difficult to know how his proposals can be operationalised.

(iii) Bottom up governance seeks to deal with the asymmetric information problem by an inclusive sharing of power between top managers and those with information and ideas, vying to succeed to this layer. Sharing decision power in a more inclusive way – possibly through representation on the board as in the German model - aims to restore some of the managerial autonomy that has been lost with the rise of shareholder value ideology: it identifies managerialism with faster growth (Marris 1964). The asymmetric information that is of importance in this approach lies mainly within the company, the argument being that superior information is held by layers of management below the very top team. The associated projects cannot get articulated because senior management cannot (or is not incentivised to) find a credible way of convincing investors of the long term merits of these projects. In recent years executive power has been concentrated at the top in a way that risks losing the knowledge contribution of those managers with the biggest stake in the company’s long-term future. Here the emphasis is less on the investors as short-termist and more on the way that senior management itself has become culturally conditioned to short-termism, partly perhaps as a result of high powered incentive systems. There is an important echo of this feature in Hatsopoulos et al (1988) who argue that failures in the financial system that persist for extended periods produce effects at company level that run deeper than rational calculation as executive culture adapts to the prevailing environment. In effect it is hard to disentangle financial and company influences on the investment climate. Research shows that firms perform better when they have a higher proportion of top management not appointed by the current

CEO, *i.e.* with more independent positions in the management hierarchy (Landier et al 2005). Such “bottom up governance appears to work by creating a climate that allows financial short-termism to be challenged with internal long-run thinking. Reforms here centre on a reform of company law.

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