SHORT-TERMISM, IMPATIENT CAPITAL AND FINANCE FOR MANUFACTURING INNOVATION IN THE UK

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Abstract
This report analyses the links between financial market structures, governance systems and investment behaviour in the UK focusing in particular on investment in R&D. It assesses the extent to which business decision taking in the UK is as a consequence affected by 'short-termism'. Taken together, the qualitative and quantitative literature reviewed in this report provide substantial evidence for both absolute short-termism in UK financial markets and relatively higher short-termist attitudes compared to other countries. This would imply a bias against long-term innovation intensive investment in manufacturing in the UK liberal market economy.

Keywords: Short-termism, Innovation, R&D, Corporate Governance, Varieties of capitalism

JEL Codes G3, L5, O31, O32, P5

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Executive Summary

This report has two objectives. First, it seeks to analyse the links between financial market structures, governance systems and investment behaviour in the UK focusing in particular on investment in R&D. Second, it is designed to assess the extent to which business decision taking in the UK is as a consequence affected by 'short-termism'. The motivation for this analysis is the concern that UK financing patterns may inhibit investment to the detriment of the innovative performance and competitiveness of UK manufacturing.

To meet these objectives the report:

1. Provides a framework for analysis based on an overview of conceptual approaches which have sought to draw a link between the national characteristics of financial systems and their impact on innovation finance and innovation performance.
2. Provides an overview of UK manufacturing performance in terms of innovation output, capital investment and expenditure on R&D and sources of finance for investment in the UK.
3. Reviews international comparative evidence on patterns of share-ownership, bank financing and the governance and financial structure of manufacturing businesses over the past two decades. The international coverage specified by the Foresight project in commissioning this report covers the US, the Scandinavian economies, the UK, China, Japan, Korea, Germany and France. For these economies a set of data is where possible provided on financing characteristics, share-ownership and R&D. Wider literature on these and other countries is also reviewed.
4. Reviews evidence and existing studies relating to the impact of international differences in patterns of share-ownership, bank financing, governance and financial structure across countries on the relative corporate time horizons used in financing and innovation decision-making in UK manufacturing. This includes a review of investment decision-making in different national systems of finance.
5. Assesses the extent to which there is or is not convergence between national systems arising from increased globalisation of financial markets. This is used alongside broader issues affecting capital market developments as the basis for indicating likely future trends in this area in the UK in the next two decades.

The principal focus of the report is on publicly listed companies and the relative role of equity based and public bond market finance compared to bank loans in their financial structure. It also discusses evidence on venture capital

investment. The report is not concerned with issues of small business finance more generally although it provides evidence on the relative role of smaller and larger businesses in R&D activity in the UK. The report does not review the extensive literature which attempts to account for differences *within* countries in investment and innovation performance across companies that have different ownership and governance characteristics. Nor does the report review the large literature on the generic problems of financing innovation which has been fully covered elsewhere (see, for example, Hall and Lerner, 2010, and Hughes, 2013).

The principal focus of the report is on innovation related expenditure and in particular R&D. This is because it is in these areas that long-termist and short-termist tensions are most acute. Moreover, R&D is a key component of manufacturing innovation expenditure and manufacturing R&D accounts for a disproportionally high share of overall R&D expenditure in the UK (Hughes and Mina, 2012).

National Financial Systems and Innovation Finance

The idea that the nature of financial systems may vary across countries and may affect both the financing of innovation and the nature of innovation activity is well established. The report reviews three broad and partially overlapping approaches to the topic. These are based respectively on comparing "varieties of capitalism"; contrasting bank based (insider) with stock market based (outsider) systems; and comparing financial systems with different 'legal origins'.

The report concludes that a principal implication of the varieties of capitalism literature, the insider and outsider models and the legal origin debate is that the analysis of the financing of innovation requires a holistic approach. In particular, it requires an analysis of the institutional complementarity between labour markets and financial markets. It also requires an assessment of patterns of financial intermediation in the economy, and of the relationship between patterns of shareholding and the overall nature and sources of financial flows available to firms.

Each of the three approaches reviewed proceeds from certain hypothesised structural features of financial systems to potential differences in the way that financial functions are performed.

In the case of the varieties of capitalism approach a broad distinction is drawn between liberal market economies (LMEs) such as the US and the UK with large stock markets and an emphasis on 'arms-length' product capital and

labour market relation, and coordinated market economies (CMEs), such as Japan and Germany. CMEs are argued to have: a greater reliance on inter-firm and firm-bank coordination of activities; to be less reliant on the stock market; and to be characterised by long-term contractual commitments in the labour market. On this basis the UK is typically classified as an LME. In this approach considerable emphasis has been placed on the style or form of innovation that will be financed as opposed to the overall supply of finance for innovation more generally. Thus it is argued that in LMEs like the UK radical innovation and high-technology intensive sectors will be relatively dominant and in CMEs incremental innovation and medium-technology intensive sectors will be favoured.

In the case of the bank versus stock market models and the legal origins literature a key question is how the systems and their legal origins may engender differences in governance structures and resource allocation. In each case the outcomes in terms of decision-making and incentives to fund long-term investments are mediated by patterns of corporate governance and the relative significance attached by key players in the governance system to long- and short-term outcomes. In general, the bank versus stock market based literature points to a more patient long-term approach in the bank based systems compared to stock market based systems like the UK.

In the legal origins approach it is argued that the UK as an English-legal-origin system. This implies it has a financial market with a comparative competitive advantage based on more highly developed contract and property rights protection in financial markets and weaker worker protection in labour markets. This implies a positive impact on the scale and direction of investment flows for innovation with high stockholder protection in particular favouring an equity-based financial system at the expense of debt and banks.

An assessment of the impact of finance for innovation and of the balance of these forces in the UK compared to other countries requires an assessment of; the relative significance of internal funds and retentions compared to external capital; the relative role of banks and other financial institutions on the supply of external funds for innovation; the impact on retention policy of stock market reactions to dividend payments; the extent to which ‘external’ influences are mediated by the ‘active’ or ‘passive’ stance of external suppliers or intermediators of finance; the extent to which external capital market players become involved through board membership in corporate decision taking either in association with or separately from the direct ownership of equities; the extent to which share ownership is concentrated or dispersed across types of external shareholders; and the role played by banks as key channels of financial

flows from the household to the corporate sector compared to other financial institutions and as holders of equity.

This report considers evidence relating to each of these in the case of the UK and their potential implications for short-termism compared to other countries. Prior to this analysis the report reviews the evidence of the comparative innovation performance of the UK and he linked investment inputs into the innovation process, including in particular the nature and form of the UK R7D effort.

Innovation Output

The UK is a medium performer in terms of innovation outputs and typically ranks at the top of a second group of innovation "follower" nations. The EU Innovation Scoreboard rankings for 2013 place the UK 9th out of the European Union 27 countries. These innovation output rankings are based on combinations of different dimensions of innovation inputs and output and span the whole economy.
Innovation measurement in relation to manufacturing alone and focussing on outputs specifically are less common. The most recent attempts to construct an indicator which includes the performance of manufacturing in terms of the contribution to trade of high-tech and medium-tech manufacturing products as a proxy for innovation output place the UK in the middle ranks of innovating countries. The performance of the UK in terms of the contribution of medium and high-tech manufacturing products to the trade balance is particularly weak in relation to Germany and Japan and the UK also lags France in this respect.

If the focus is on high-tech exports alone as an indicator of radical innovation, then the UK has a higher share of such exports in its overall manufacturing export activity compared to Germany. However, the German economy has a much larger manufacturing export sector and as a result produces an order of magnitude greater volume of high-tech manufacturing sector products and has a much higher share of world high-tech export trade than the UK. Making a distinction between radical and incremental innovation on this basis makes little difference to the UK's position as an innovation follower based on wider sets of indicators.

Expenditure in Support of Innovation

The UK ratio of capital investment to manufacturing output in the UK has been low relative to competitor economies for many decades and continues to be so. Investment since the financial crisis has been particularly poor both absolutely and in comparison with competitor countries.

The performance of ICT investment has been better and is closer to that of other economies.

The growth of capital per worker in manufacturing has also been about the average of competitor countries.

Investment in R&D

The UK is at the lower end of the international spectrum in terms of the ratio of overall gross expenditure R&D to GDP. It ranks below Japan, the USA and China in the overall scale of its R&D effort as well as behind Korea, Germany and France.

In the past two decades the UK has experienced a small decline in the share of gross expenditure on R&D in GDP. Finland, Korea, Japan, Denmark, the US, Germany, France and China all experienced increases over this period.

Within the overall performance of R&D in the UK economy, business expenditure on R&D is at the lowest end of the spectrum internationally.

In the period 1999-2010 there was a fall in the ratio of business expenditure on R&D to GDP.

The relatively poor performance of business expenditure on R&D is not explained by the fact that the UK has a relatively service intensive economy. When business R&D performance is corrected for differences in the share of activity between sectors of different levels of R&D intensity such as services, the UK still remains at the bottom end of the league table.

If attention is extended to include a wider range of intangible investments to include investment in intellectual property and brand equity and firm-specific human capital and organisational capital the UK's position improves somewhat in terms of the overall innovation related expenditures to GDP. The UK still nonetheless comes joint bottom with Germany on this adjusted basis in the comparator group of countries analysed in this report.

For the manufacturing sector on its own, business R&D relative to manufacturing value added is also relatively weak. The UK is at the bottom end of the league table and the UK has experienced one of the smallest increases in this measure of manufacturing R&D intensity in the sample group.

Business expenditure on R&D is relatively concentrated in high-technology sectors in the UK, whilst in Germany such expenditure appears to be relatively concentrated in the medium-technology sectors. However, since manufacturing business expenditure on R&D as a percentage of GDP is much higher in Germany and in economies such as Japan and Korea than it is in the UK, those economies spend absolutely more on “radical” high-technology sectors than is the case in the UK.

The UK is an extreme outlier in terms of the funding of R&D by overseas businesses. The proportion of UK business enterprise R&D which is funded from overseas sources is twice as high as the next ranked country in the comparator sample and is around five times as high as is the case in Germany.

In addition to a relatively very high reliance on overseas funding, the UK is also characterised by a very high reliance on the performance of R&D in the UK by foreign owned businesses.

Between 1995 and 2011 business expenditure on R&D performed by foreign owned businesses in the UK more than doubled. By 2011 foreign owned business performed more R&D in the UK than UK-owned businesses did.

The UK is therefore more susceptible than other countries to decision making by overseas investors and the boards of directors of overseas multi-national corporations. These overseas holdings are dominated by US investors and parent companies. If US businesses and investors are subject to similar short-term pressures as UK investors and boards, this will reinforce any such tendencies which exist in the UK and vice versa if stock market strength enhances radical long-term innovation.

Government Funding for Manufacturing R&D

The UK is a middle ranking country in terms of the percentage of manufacturing business expenditure R&D which is financed by the government. It is around 9% in the UK compared with, for example, 14% in France, 11% in the United States and 4.5% in Germany. The potential role for the public sector to act strategically in relation to its funding for manufacturing R&D in the UK is significant.

Large and Small Businesses and R&D

In the UK, business expenditure on R&D is dominated by large businesses and their subsidiaries. Independent small and medium-sized enterprises in the UK which employed fewer than 250 employees are negligible in terms of the overall UK R&D effort. They account for less than 4% of total R&D.

International comparisons of the relative role of independent small and medium-sized enterprises are not readily available, but analyses, which include the definition of small and medium-sized enterprises subsidiaries of larger firms, the UK appears to be in the middle rank in terms of importance of firms employing less than 250 employees in the overall business R&D effort.

The domination of the R&D effort in the UK by larger firms means that government financial support is similarly concentrated. As a result, in 2008 the UK had the smallest proportion of government financial support for business expenditure on R&D which went to small and medium-sized businesses.

Higher Education Sector Expenditure R&D

The UK ranks towards the lower end of the international spectrum in terms of higher education R&D as a percentage of GDP and has lagged behind other economies in the extent of increases in expenditure on higher education in recent decades.

The extent to which the business sector funds higher education R&D has been weakening across a number of economies, including the UK, in the period 1990-2009, but the fall was greater in the case of the UK.

Sources of Business Finance for Investment in R&D

In the UK as elsewhere the most important source of finance for investment in R&D are the internal cash flows available to the firm from retained profits. In the UK the issue of equity on the stock market has historically been a relatively small source of funds for new investment by private non-financial corporations. Moreover, the share of manufacturing companies in total UK stock market equity capitalisation fell significantly from 26.3% in 1998 to 16.2% in 2006 in line with the de-industrialisation of the economy.

Nevertheless, the UK has the characteristics of a liberal market economy. Thus equity accounts for around a quarter of the balance sheet value of the external financial assets of UK companies. It occupies this place, however, principally because of the equity issued at the time of public flotation or from the issue of new equity in relation to takeovers of other existing companies. Where new external finance has been raised in the UK, loans and bonds have historically been more important than equity. Around 50% of the outstanding value of debt and equity combined takes the form of bank loans, around 25% takes the form of public corporate bonds and around 25% is accounted for by equity. Banks and loans therefore have an important role to play.

The relatively small role of the stock market as a source of new funds for investment means that its principal functions in the UK are related to two other roles. The first is as a route by which investors in new businesses may exit from early stage investments and extract the value of investment by floating on the stock exchange. Second, it plays a potentially important role through the allocation of corporate control between competing management teams. In this market for corporate control takeovers are a potential means of raising the efficiency of investment activity by concentrating control in the hands of the "best" management teams.

The UK has by international standards one of the highest levels of merger and acquisition activity. There is abundant evidence that shows that this market does not typically work to improve the long-term performance of businesses that are acquired. Long-term improvements in measures of corporate performance, such as growth profitability and/or more direct measures of innovation are not the typical outcome of takeovers. It is more plausible to argue that the excessive pre-occupation with short-term share price performance to avoid the threat of takeover rather than organic investment makes the market for corporate control a hindrance rather than a help to improving UK investment and innovation performance.

Financial Institutions, Banks and Share Ownership

UK holdings of the shares of non-financial corporations in the UK by domestic financial institutions, such as pension funds, are much higher in the UK than elsewhere in Europe and cross holdings by non-financial corporations are much lower. The ownership of shares in non-financial corporations in the UK by banks has increased from a very low level over the period 1997-2004. It remains much lower than in Germany, France and Sweden. Banks and intra-company shareholdings are therefore a relatively small part of the UK corporate governance structure.

Overseas Ownership of UK Manufacturing Company Shares

In the period 1998-2010 there was a rapid increase in the dominance of overseas shareholdings and a decline in individual holdings and in holdings by insurance companies and pension funds.
Of the world's shareholdings in UK quoted companies 84.6% were focused on the FTSE top 100 companies. These shareholdings were dominated by investors from Europe and North America. The Asian economies accounted for only 11% of holdings compared to 56% by North American and 26% by European investors. Where US funding and ownership predominates then any UK liberal market economy decision making and management and labour market practices may be reinforced and vice versa for German, Japanese and Korean investment.

The UK has not been alone in experiencing an increase in the internationalisation of its stock market. There has been some convergence towards the UK in the case of France, but more muted movements in the case of Japan and Germany. The UK difference is with the latter two systems may therefore be persistent in coming decades.

Short-termism

The idea that UK capital markets and corporate decision takers exhibit short-termist or myopic attitudes in relation to investment decision is of long-standing and is consistent with elements of the role played by stock markets in the varieties of capitalism and bank versus equity approaches. The essence of the argument is simply put. If individuals or businesses are compared and one places a relatively lower value on income streams earned in the future compared to another, then the former exhibits relatively myopic tendencies.

For UK investment and financing decisions to be relatively myopic, and for this to have a detrimental effect on UK economic growth and welfare, it is necessary to show that UK financial markets and investment decision-makers have a

higher rate of discount for future earnings than similar decision-makers in other countries.

For this to be a problem, it is also necessary in turn to explain how this has a deleterious effect on the kind, as well as on the amount, of investment undertaken. In the presence of very high rates of discount of future earning streams, long-lived assets and those which generate their returns in a disproportionate way towards the end of the path from development through to investment and sales will be disadvantaged. The argument has particular force in relation to investments in R&D. This is because R&D projects are likely to have returns more heavily concentrated towards the end of their overall life cycle. The link between myopic decision taking and R&D and innovation activity is therefore of particular concern.

Measuring Short-Termism

Attempts to measure the degree of myopia in the UK and its extent relative to other countries rely on two sorts of evidence. One sort is based on questionnaire and interview analyses of the attitudes of corporate decision-makers. This focuses on the extent to which they perceive that their actions are judged by financial market investors in a way which will penalise long-term investments compared to short-term investments. It is important to note that these perceptions may not need to be based on an objective state of affairs in the market. It is sufficient that they are perceived to be the case for corporate decision taking to be effected.

An alternative approach is to look at movements in share prices and assess the extent to which they follow a path which would be consistent with applying "appropriate" rates of discount to the future earning streams and final capital values of the companies which issue them. This approach basically involves discounting future dividends back to current values using rates of discount which would be "appropriate" in the sense that they reflect a risk free rate and a risk adjustment element based on the observable risk characteristics of the relevant company whose decisions are being examined. To the extent that current share prices are less than would be expected using those discount factors, then the implication is that the market is discounting future returns too heavily. It is acting myopically and attributing too low a present value to the future earnings stream.

Taken together, the qualitative and quantitative literature reviewed in this report provide substantial evidence for both absolute short-termism in UK financial markets and higher short-termist attitudes than in other countries. This would imply a bias against long-term innovation intensive investment in

manufacturing in the UK liberal market economy. A number of aspects of the evidence reviewed is consistent with this view.

The first is that the higher sensitivity of R&D to cash flow in the UK compared to Germany is consistent with the view that UK firms avoid raising external finance by relying more on internal cash flow and may thus be restricted by their own internal profit flows.

Second, variations in financial institutional variables across countries appear to affect R&D more than investment and therefore the specific features of the UK may bear more heavily on its R&D performance.

Third, "high" corporate governance ratings enhance the responsiveness of corporate strategy to short-term financial market expectations and will be detrimental to longer term R&D. Therefore the UK which has 'high' governance quality rankings may do worse in terms of R&D. This is supported by analyses of the impact of higher shareholder protection.

Fourth, the absence of large equity blockholdings is associated with a weaker ability to resist short-termist financial market presence, and such holdings are rare in the UK.
Fifth, it appears that UK venture capital companies (along with those of the US) use higher required rates of return than is the case in the Netherlands, France and Belgium. This is consistent with relatively myopic behaviour in the UK. M
More qualitative analyses focusing, inter alia, on sectoral patterns of investment and distribution of funds across different stages of investment find fewer systematic differences in venture capital between the UK and other countries.

The extreme openness of the UK VC market in terms of flows of funds into and out of the UK means that compared to Germany, for example, the UK VC market is much less focused on the domestic economy and the development of domestic businesses than in the case of other countries.

Financial Systems and Long-Term Investment: Future Scenarios

In the future currently long-term oriented investors (such as private family investment offices, endowments/foundations, sovereign wealth funds, defined benefit pension funds and life insurance) may increase in significance.

However, the traditionally powerful defined benefit pension fund allocation is likely to decline because of: the shift from defined benefit plans to defined contribution plans; the associated closure and sales of such schemes to third parties and increases in defined contributions. In addition, ageing populations in

countries with established pension systems will involve increased pay-outs and lower proportions of funds under management.

In addition to these trends, a number of constraints are forecast to have an adverse effect on long-term investing capacity. These are related to: a reducing appetite for uncertain long-term outcomes on the part of family offices, increasing pressures from trustees and beneficiaries in the case of endowments and foundations as they seek to move away from illiquid investments; and an offsetting movement on the part of sovereign wealth funds to slow down investment in risky and illiquid investments. Pension fund investments in the longer term are forecast to be adversely affected by regulatory changes, including mark-to-market accounting, stricter funding and solvency requirements and maturing liabilities. Similar changes associated with solvency regulations are forecast to affect the policies of life insurers.

The implications for equity markets of these changes are quite substantial and have already led to a substantial reduction in the involvement of pension funds exposure to equities. In the UK these fell as a % of total pension fund assets from around 70% in the 1990s to less than 40% by 2008. In the case of the UK these changes have as we have seen earlier led to an overall decline in the proportion of institutional investment holding of equities in the UK. There has as we have seen been a counterpart rise in the proportion of ownership of UK assets which takes the form of overseas holdings. These, however, include pension and insurance fund and other long-term investors from overseas. Thus institutional investment *per se* may not have fallen so dramatically as the broad trends in shareholding patterns in the UK indicate. On the other hand, the fact that these investors are overseas means that it is even less likely that they will be engaged in more direct relationships with the companies whose shares they hold than UK institutional investors have been. There is also evidence to suggest that in the case of the US at least they are under similar short-termist pressures as their UK counterparts.

Reforming governance to have a stewardship rather than a shareholder value focus will play a crucial role in resisting any increasing pressure for short-term returns from these medium term changes in patterns of long-term investor behaviour.

In the medium to long-term the prognosis for the UK in the absence of such counterveiling policy initiatives is for persistent short-termist pressures and a lower rate of long-term innovative investment in manufacturing than might otherwise be the case.

Convergence in Financial Systems and the Finance of Innovation

The idea that convergence in financial and governance systems across capitalist economies was inevitable as a result of the superior performance of the English legal origin stock market based systems has been widely canvassed. The evidence we reviewed in this report suggests that this convergence and the triumph of a particular system of stock market financial relationships and governance is exaggerated. Significant differences remain between financial systems.

Economies, such as the UK and the US which are seeking to rebalance their economies away from the services sector, face major challenges in terms of the financing of long-term R&D.

The evidence reviewed suggests that more coordinated patient capital structures such as in Germany are more productive in terms of long-term investment in R&D and innovation. Systems such as the UK which depend more on arms-length relationships and a capital market with myopic behaviour will be less likely to invest in longer term innovation investment. The importance of the public sector in the US and the UK points to the potentially strategic role that public investment can play in 'liberal' market economies, such as the UK.

A critical issue for the UK is whether its finance and governance system can evolve away from short-termism pressures. Different national systems of finance and innovation have embedded in them factors which will predispose them to react to shocks in ways which are consistent with the established beliefs and practices of the firms and workers in those economies. Thus in response to an external shock a liberal market economy such as the UK may seek to pursue even more liberal market policies by more deregulation. On the other hand, in coordinated market economies the reverse may be true.

In thinking about the next 30 years, the question is whether the UK will be better served by more deregulation or by an attempt to alter structural characteristics which inhibit its pursuit of long-term investment behaviour in UK manufacturing. This is precisely the area in which the debate about industrial policy is now being conducted in the UK and elsewhere. It should lead to a fundamental re-examination of the way in which intermediate coordinating organisations can be created in a liberal market system economy such as the UK.

Current industrial policy debates emphasise the need to develop strategies around the allocation of resources to strategic sectors. Insofar as those sectors and technologies involve the accretion and consolidation of wide ranges of

knowledge and expertise then the development of institutions (e.g. catapult centres) which have the potential to assist in “coordinating” these connections, become a central part of industrial policy.

The great interest in such intermediate institutions in the UK at present indicates the extent to which this message is being absorbed into industrial policy debates.

In this connection the fact that economies characterised as liberal market economies and coordinated market economies each contain within them sectors which are characterised as both experiencing radical and incremental innovation means that a view will need to be taken on a much more granular basis of the particular factors likely to inhibit or encourage innovation in each sector. Basing policy on an aggregated view of how the economy looks on average, or on its inherited structure from the past seems less helpful. The challenges facing the development of such a disaggregated and medium to long-term policy in the UK are discussed in a companion report for the Future of Manufacturing Project (Crafts and Hughes, 2013).

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2. National Financial Systems and Innovation Finance

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2.2 Varieties of Capitalism

One well known stream of literature which has focused on issues of governance and coordination in the relationship between financing and innovation is the varieties of capitalism approach (e.g. Hall and Soskice, 2001a). This categorises national political economies on the basis of the way in which firms resolve coordination problems. These problems arise in the spheres of industrial relations, vocational training and education, corporate governance, customer and supplier inter-firm relations and, finally, internal employee coordination. From the point of view of this report, financial aspects of innovation emerge most closely in the analysis of corporate governance. This is seen as having a critical impact on the nature of finance sought; the way in which investors and

the suppliers of finance interact; and the way the latter seek to monitor and assure returns on their investments (see for example Hall and Soskice, 2001b).

A core distinction in the varieties of capitalism literature is between the ideal types of "liberal market economies" and "coordinated market economies". In the former coordination activities are primarily by a combination of competitive markets and intra-firm hierarchies. Market relationships are arms' length and set in a competitive and formal contracting framework. In coordinated market economies, non-market relationships are more important as coordinating devices. This implies much more inter-organisational relational activities, and less complete contracting. Monitoring is based not upon market signals, but on the exchange of insider information of various kinds. In liberal market economics, "equilibrium" outcomes in terms of firm behaviour are seen as moderated by adjustments to market prices. By contrast strategic interaction amongst firms and coordinated outcomes are seen to be the key determinants of movements towards stable outcomes in coordinated market economies. In coordinated systems, particular sets of organisations and institutions (rules of conduct, norms of behaviour) are focused on reducing the uncertainty associated with the behaviour of others so that mutual credible commitments can be made. The institutional rules of behaviour include substantial exchange of information, behavioural monitoring and sanctions for defectors from corporate behaviour. This implies strong networks across employers and labour organisations. In relation to financing this means, in particular, the development of patterns of cross-firm shareholdings and close relationships between banks and the businesses they fund.

Proponents of the varieties of capitalism hypothesis contend that there will be systematic differences in corporate strategy, including innovation behaviour, between varieties of capitalism. These are based on differences in the overall institutional framework within which those firms operate. In particular, and of most relevance, in relation to investment and innovation, they argue that

> "firms and other actors in coordinated market economies should be more willing to invest in *specific* and *co-specific assets* (i.e. assets that cannot readily be turned into another purpose and assets whose returns depend heavily on the active cooperation of others), while those in liberal market economies should invest more extensively in *switchable assets* (i.e. assets whose value can be realised if diverted to other purposes)."
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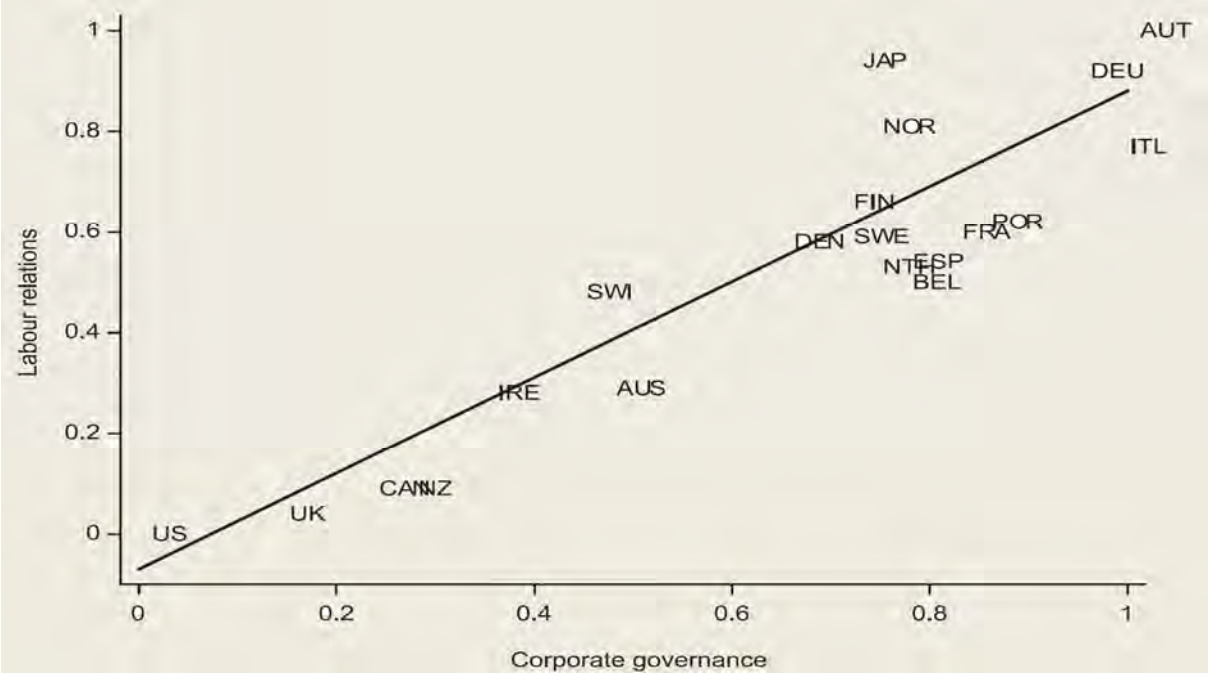
> (Hall and Soskice, 2001b, p.17).

In relation to the financial system (and the closely related way in which corporate governance institutions work), it is argued that in co-ordinated market economies access to long-term "patient capital" is complementary to labour market coordination based on the long-term retention of a skilled workforce and to investment in generating long-term returns. Information considered private, or insider, information in a liberal market based system must be available in a coordinated market system to those whose investments in the business are expected to lead to long-term gains. The result is highly networked activities within the corporation and between firms. It is also argued that this implies less scope for unilateral decision-making by top management in organisations in coordinated market economies than in liberal market economies.[1]

In the case of innovation these aspects are associated with the argument that coordinated market economies will be better suited to supporting incremental innovation. In this case continuous, but small improvements are made to what are relatively stable slowly changing sets of products and processes. In liberal market economies on the other hand, the capacity for rapid top executive policy change and flexibility in the reallocation of human and other capital is taken to imply that they should be better at supporting radical innovation in sectors where there are rapid and discontinuous changes in technology (see for example Hall and Soskice, 2001a). We review the evidence of this particular aspect of innovation in Sections 3.2 and 3.3 below.

A further point which emerges from this approach is that it is not possible to assess the impact or efficiency of coordinating activities in one sector, say, for instance, financial markets without considering relational patterns in other markets. The argument here is that there are important complementarities between institutions in different parts of the economy. In a financial system in a liberal market based economy, the responsiveness of financing to short-term movements in profitability will not work well with a labour market in which firms seek to maintain long-term employment contracts. The latter would prejudice the ability of a firm to make short-term flexible reallocations or reductions of its labour inputs. In assessing the extent to which different forms of finance and different types of financial coordination are effective in inducing differences in innovation performance, it is essential, therefore to consider simultaneously the nature of coordination in labour and capital markets. Empirically this leads to the view that economies should cluster into broad groups. Those in which the employment and financing spheres are relatively highly dominated by market transactions on the one hand and those where direct coordinated activities dominate on the other.

Exhibit 1 The balance between market and strategic co-ordination in labour relations and corporate governance in OECD countries



Note: On each axis, movement away from the origin indicates higher levels of strategic co-ordination in the relevant sphere of the political economy and movement towards the origin indicates higher levels of market co-ordination. The scales on each axis are normalised scores based on the loadings from a factor analysis in which corporate governance is characterised in terms of shareholder power, share dispersion and the size of the stock market and labour relation are characterised in terms of the level and degree of wage co-ordination, and labour turnover.

Source: Hall and Gingerich (2009)

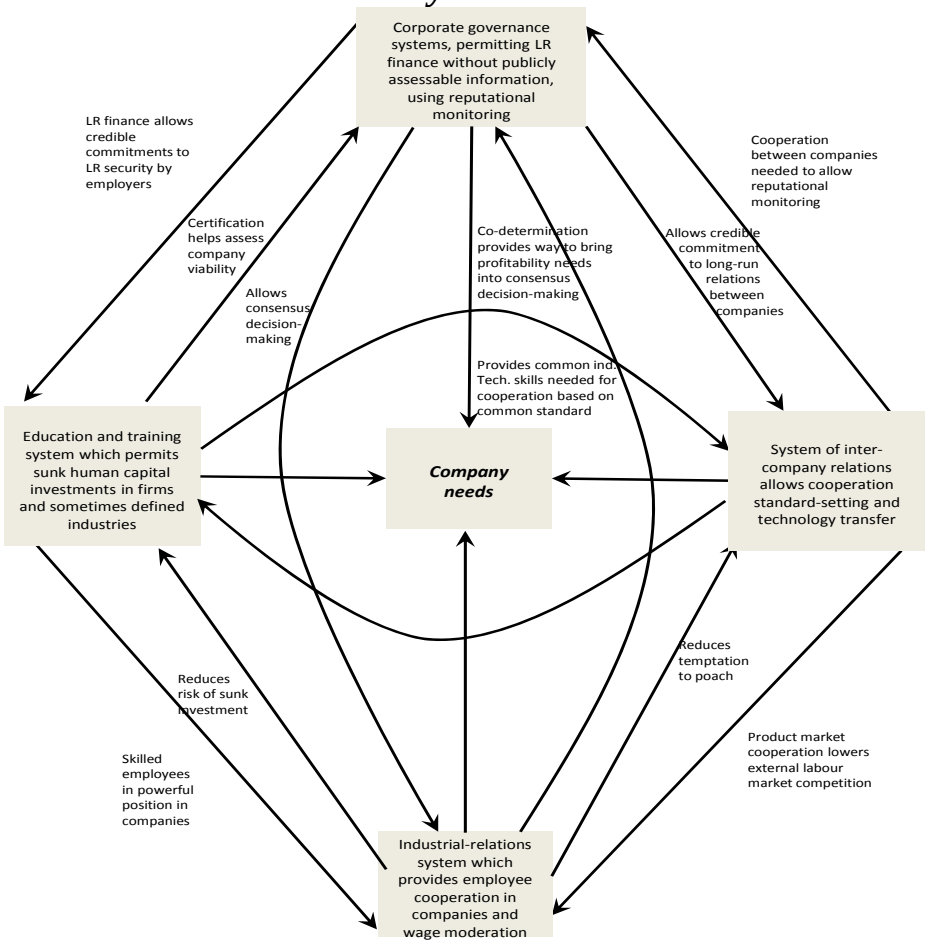
This complementary clustering is shown in Exhibit 1. It is clear that strong complementarities exist and that the UK is with US at the extreme liberal market economy end of the spectrum.

A process exposition of the way complementarity works is provided by Hall and Soskice (2001b). They provide a comparison of the US and Germany as archetypal liberal and coordinated market economies respectively. They provide the diagrammatic summary which is reproduced in Exhibit 2.

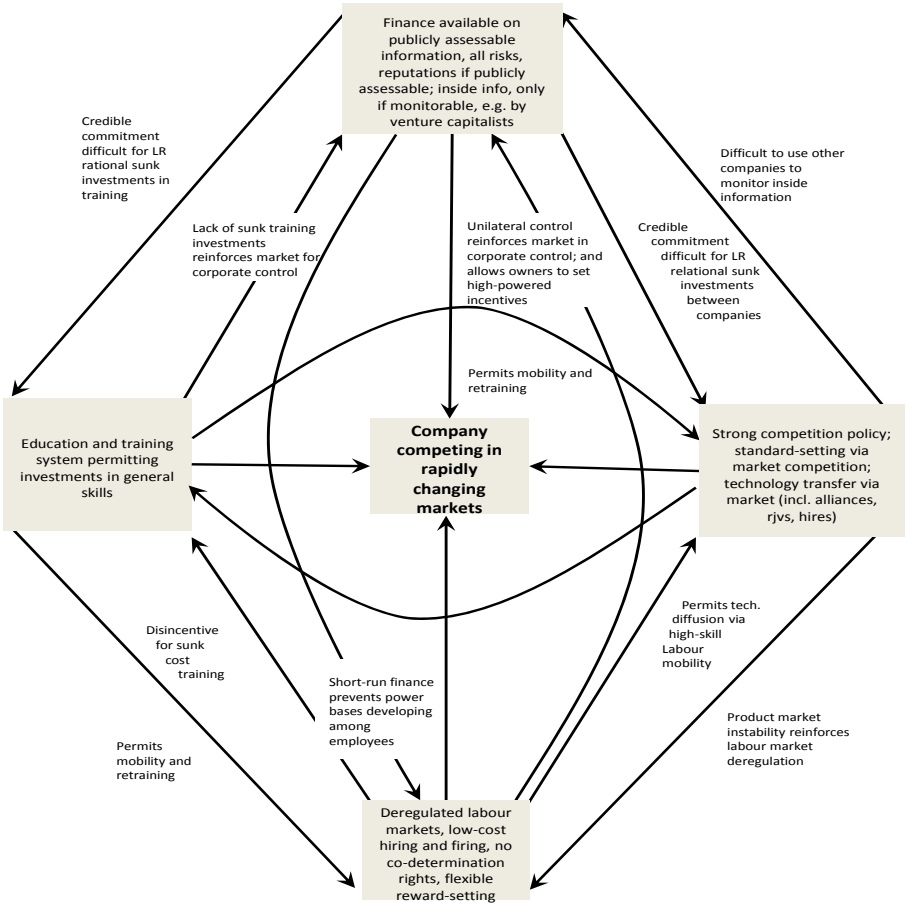
The complexity and interrelated nature of the relationships shown poses a major challenge if quantitative economic analyses are to be carried out and countries compared in terms of their variety of capitalism. Nevertheless both Hall and Soskice (2001b) and others have attempted to do so (see, for example, Allen, 2004; Allen et al. 2006; Casper and Whitley, 2004; Hall and Gingerich, 2009).

Exhibit 2 Coordinated and Liberal Market Economies: Complementarities across sub-systems in Germany and the USA

Complementarities across subsystems in the German coordinated market economy



Complementarities across subsystems in the American liberal market economy



Source: Hall and Soskice (2001) Fig 1.3 p.28 and Fig. 1.4 p.32s

Note: rjvs=research joint ventures

The idea that firms may differ in their strategies and behaviour across varieties of capitalist market economies has been challenged by the notion that internationalisation in terms of trade and financial flows will lead to the triumph of one form over another. In particular it has been argued that the growth of stock market based liberal market economies will lead to the eclipse of coordinated market economies (Hansmann and Kraakman, 2004; Dore, 2000; and for a less pessimistic view of CMEs Berger and Dore, 1996).

Varieties of Capitalism: Classifications, Convergence and Changes over Time

Schneider and Paunescu (2012) provide a recent classification exercise and also show changes over time. They analyse 26 OECD countries over the period 1990 to 2005. They take eight measures of institutional characteristics relevant to the varieties of capitalism hypothesis and using factor analysis identify five groupings which range on a spectrum from state dominated economies (SDEs) to liberal market economies (LMEs).[2]

Exhibit 3 shows that on the basis of their classificatory procedure countries change their variety of capitalism status over time. It also appears, in line with the convergence hypothesis, that there may be a drift towards the more liberal market end of the spectrum over time. However, some major economies, including Austria, France and Germany, remain in the coordinated market economy (CME) cluster over the whole period. Moreover, between 1999 and 2005 there is a movement *away* for LME to LME-like in the case of Finland, Ireland, New Zealand, Australia and the Netherlands. Japan, which frequently appears in the variety of capitalism literature, as a CME is in the hybrid economy group based on this analysis. It is not clear why the particular indicators chosen in this study should produce such a distinctively different outcome in the case of Japan than in other major studies within this tradition. The significant finding from the point of view from this report, however, is that the UK is clearly in the LME group throughout the period 1990 to 2005, and on that basis may be expected to be characterised by lower rates of incremental innovation, higher rates of radical innovation and be less well supplied with "patient capital" to support cooperative investment in specific and co-specific assets.

Exhibit 3 Varieties of Capitalism, 1990-2005

Cluster	1990	1999	2005
State-dominated economies	TURKEY ITALY SPAIN **Belgium** GREECE	TURKEY PORTUGAL GREECE SPAIN	PORTUGAL GREECE TURKEY
Coordinated Market Economies	**Austria** **Germany** **Denmark** **Finland** **Sweden** FRANCE **Netherlands**	**Austria** Czech Republic **Italy** FRANCE **Germany** **Belgium**	**Austria** **Belgium** **Germany** FRANCE
Hybrid economies	**Norway** **Japan**	South Korea Poland Hungary **Norway** **Japan**	Poland ITALY **Norway** Czech Republic Hungary South Korea **Japan**
Liberal Market-like economies	*Australia* *New Zealand* *Rep. of Ireland* **Switzerland**	**Denmark** **Sweden**	Spain **Finland** **Netherlands** **Sweden** *Australia* *Rep. of Ireland* *New Zealand*
Liberal Market Economies	*Canada* *USA* *UK*	**Switzerland** **Finland** *Rep. of Ireland* *New Zealand* *Canada* *Australia* **Netherlands** *UK* *USA*	**Switzerland** **Denmark** *UK* *Canada* *USA*

Notes:

Bold: economies discussed as CMEs by Hall and Soskice;

Italics: economies discussed as LMEs by Hall and Soskice

Capitalised: economies discussed as Mediterranean by Hall and Soskice

Source: Derived from Schneider and Paunescu (2012) Table 1, p.10.

2.3 Bank Based (Insider) and Stock Market Based (Outsider) Financial Systems

The distinction between liberal market economies and coordinated market economies is readily linked conceptually to a parallel literature on the emergence and nature of financial markets. Here a distinction between bank based and stock market based systems is typically drawn. In this literature arms-length relationships in the stock market based systems are contrasted with co-ordinated long-term relationship banking in the bank based systems.

In the bank based systems a significant role is played by banks as key intermediaries in channelling household savings to the business sector. They are also seen as playing a significant role in equity markets as holders of large blocks of stock in industrial companies. This distinction in turn relates to another approach to the analysis of corporate stock holding. This approach emphasises the distinction between "outsider" and "insider" patterns of corporate control and governance.

In "outsider", stock market based systems dispersed shareholder influence is exercised through relative price signals. Impersonal buying and selling of shares in response to good or poor performance alters prices and the cost of capital. In extreme cases of bad performance, takeovers are an ultimate sanction for failing firm management. In contrast, in coordinated systems "insider" block holdings of shares are common. Influence is exercised directly rather than by indirect price signals and transfers of ownership on an open market. In the insider/outsider dichotomy, the block holding insiders can include financial *and* non-financial businesses. In addition, non-shareholding stake holders, such as the labour force and labour unions, may be included in corporate influence on decision-making through their involvement in particular models of corporate governance. This includes, for example, in the German case two tier boards (Allen and Gale, 1997; Carlin and Mayer, 2003; Mayer, 1998, 1988, 1990; Franks et al., 1990; Dore, 2000; Mayer and Sussman, 2011; Rajan and Zingales, 1995, 2001). The state may also play a coordinating role in shareholdings as part of wider patterns of industrial or economic development strategy (see, for example, Zysman, 1983).

The implications of this approach for the financing of innovation depends on whether or not the respective 'insider' and 'outsider' systems produce governance relations which favour short or long-term orientations by corporate decision takers. If outsider stock market systems lead to a focus on short-term market price fluctuations and if the UK is such a system, then it may be subject to more short-termist pressure than bank based insider systems.

Although these insider/outsider classifications have strong complementarities with the liberal market and coordinated market models, they emphasise different components of the system. These components may move in different directions at least in principle. It is, thus, possible for bank intermediation to decrease in importance, and for bank shareholdings to decline too, whilst other insider block holding relationships, including non-financial organisations, could increase or remain the same and vice versa (see, for example, Deeg, 2009). Equally, the way in which the institutions in countries placed within these broad typologies may operate their financial systems, may also be affected by the way in which the overall legal systems within which they operate have developed (Franks et al., 2009, Cheffins, 2011, Franks et al., 2000, Franks et al., 2012).

2.4 Financial Systems and Legal Origins

In recent years a new body of literature based on the quantitative analysis of variations in legal systems across countries has developed. This has, in particular, examined the link between the "efficiency" of the legal framework within which the financial governance and insolvency systems of countries operate and in turn with their overall economic performance (La Porta et al., 1998, 2008).

In its original form this approach too has aspects which echo the coordinated market and liberal market typologies of the varieties of capitalism approach. Here, however, the contrast is made between English-law origin economies (e.g. UK, Commonwealth, USA) and Civil-Law economies (typically East Asia and most of mainland Europe). The latter in turn may be sub-divided into French, German and Scandinavian versions, although the latter two are small in number (see, for example, La Porta et al, 2008, p.290).

It is argued that the English-law origin economies have developed greater contract and property rights protection than the Civil-law origin states. The former, as a result, have a "comparative competitive advantage" in the developments of their financial markets. They may be expected to be better attuned than civil-law systems to deliver financial flows on the scale and in the form required for the efficient allocation of resources between alternative uses. This will have positive implications for the overall innovative performance and rate of growth of companies and the economy as a whole. It also implies convergence toward a superior English-law origin system.

This approach has spawned a substantial literature. Recent developments have increasingly questioned both the quality of the original underlying legal system

metrics. In addition the link between legal origin and systems performance has been questioned. In particular, and in keeping with the notion of institutional complementarity, it has led to the view that the "efficiency" of one component of an overall system of capitalism (e.g. its financial market) must be seen in the context of legal regulation of other markets (e.g. labour markets) (see, for example, Acharya et al., 2010a, 2010b; Ahlering and Deakin, 2007; Deakin and Pistor, 2012). In relation to innovation, this means that empirical analyses of the links between financial markets, governance structures and innovation have increasingly involved attempts at controlling for the legal origins of the systems alongside patterns of financing and governance (Deakin and Mina, 2012).

Deakin and Mina (2012) provide a useful summary synthesis of the legal origins and variety of capitalism approaches in relation to innovation. It emphasises the complementarity between patterns of legal protection, labour and capital market developments and innovation modes.

In this stylised classification shown in Exhibit 4 in the liberal market systems have legal support which is highest for shareholder protection, followed by medium to weak for creditor protection and weak for worker protection. In the coordinated market system the degree of support or protection is reversed. These patterns are then seen as related to distinctive modes of innovation. In the liberal market system model of innovation "radical innovation" is supported by a high risk culture with high levels of Schumpeterian creative destruction in product markets supported by strong venture capital markets and flexible labour markets. In the coordinated market systems risk sharing across capital and labour is associated with long-term commitment to human capital training and incremental innovation.

The implications for financing innovation and for the relative balance of short-termist and long-termist pressures on decision takers depends upon the extent to which the resulting governance arrangements favour each. As with the varieties of capitalism approach, however, the implication is that civil law systems may be less subject to short-termist pressures than countries such as the UK which has an English-law origin system.

Exhibit 4 Complementarities between Corporate Governance and Modes of Innovation

	Shareholder protection	Creditor protection	Worker protection	Mode of innovation
Liberal market systems	High (legal support for hostile takeover bids, share buy-backs shareholder activism)	Medium or weak (debtor in possession laws, laws favouring corporate rescue over liquidation)	Weak (minimal legal support for employment protection, no codetermination)	• Strong venture capital market • 'Schumpeterian' creative destruction regime • Higher-risk investment • High incidence of radical innovation • Efficient labour market matching
Coordinated market systems	Weak (minimal legal support for market for corporate control, limited minority shareholder rights)	Medium or strong (legal recognition of priority for secured creditor's rights)	Strong (effective legal support for employment protection and codetermination)	• Limited use of venture capital • Slower creative destruction dynamics • Investment risk more spread • Incremental tech development • Continuous employee learning

Source: Deakin and Mina, 2012

2.5 Varieties of Capitalism, Bank and Stock Market Based Systems, Legal Origins and Corporate Governance

The upshot of these developments in the varieties of capitalism literature, the insider and outsider models and the legal origin debate is that the analysis of the financing of innovation requires a holistic approach. In particular, it requires an analysis of the institutional complementarity between labour markets and financial markets. It also requires an assessment of patterns of financial intermediation in the economy, and of the relationship between patterns of shareholding and the overall nature and sources of financial flows available to firms.

Each of the approaches proceeds from certain hypothesised structural features of financial systems to potential differences in the way that financial functions are performed.

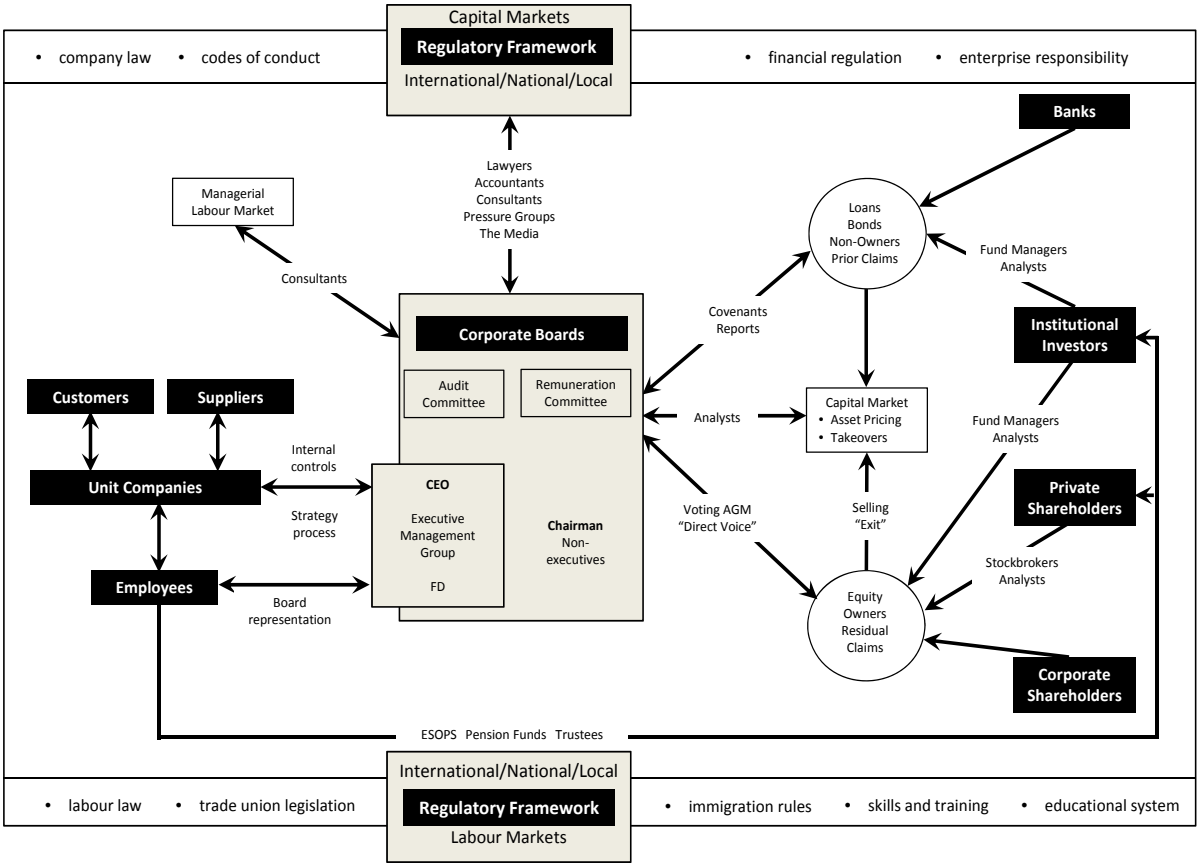
In the case of the varieties of capitalism model considerable emphasis has been placed on the style or form of innovation that will be financed as opposed to the overall supply of finance for innovation more generally. In the case of the bank versus stock market models and the legal origins literature a key question is how the systems and their legal origins may engender differences in governance structure and resource allocation. In each case the outcomes in terms of decision-making and incentives to fund long-term investments are mediated by patterns of corporate governance and the relative significance attached by key players in the governance system to long- and short-term outcomes.

In order to capture these structural and process complexities Exhibit 5 provides a schematic overview which has been used to motivate international comparisons (Hughes and Deakin, 1997). In the exhibit the corporate board is represented at the core of the system making investment and other decisions, including dividend and retention policy. The Board is subject to labour, product and capital market forces. The corporate board may itself take different forms including two tier board structures involving, for example, employee board representation. The diagram emphasises regulatory and legal factors affecting capital and labour markets. Regulation of product markets through for example competition policy or price regulation is excluded for simplicity.

It is important to note that although international comparative studies of financial systems often focus on external suppliers of finance and financial intermediaries in terms of allocation, the company itself through retained profits has an important role to play. The relative importance of retentions compared to

external finance and the governance forces affecting retentions are also key financial system features.

Exhibit 5 Capital Markets, Labour Markets and Corporate Governance: A Systems Overview



Key: CEO = Chief Executive Officer; FD = Finance Director; ESOPS = Employee Share Ownership Plans

Source: Deakin and Hughes (1997)

The role of the capital market and the sources and pathways of 'insider' and 'outsider' influence from capital market players are shown on the right-hand side of the diagram. The influence of the ultimate 'outsider' financial stakeholders is indirect and mediated by a variety of investment managers and analysts. They respond to market signals and provide interpretative advice and exercise influence by exit (selling shares) and/or voice (interacting directly with the board on an individual or collective basis). Bank influence is mediated through covenants and loan reporting processes. Variations across countries in the institutional architecture, nature of capital market and legal framework saving will affect the balance between different ultimate financial stakeholders shown on the right of the Exhibit, as will the nature of advice and management intermediation (Deakin and Hughes, 1997).

An assessment of the impact of finance for innovation and of the balance of these forces in the UK compared to other countries requires an assessment of; the relative significance of internal funds and retentions compared to external capital; the relative role of banks and other financial institutions on the supply of external funds for innovation; the impact on retention policy of stock market reactions to dividend payments; the extent to which 'external' influences are mediated by the 'active' or 'passive' stance of external suppliers or intermediators of finance; the extent to which external capital market players become involved through board membership in corporate decision taking either in association with or separately from the direct ownership of equities; the extent to which share ownership is concentrated or dispersed across types of external shareholders; and the role played by banks as key channels of financial flows from the household to the corporate sector compared to other financial institutions and as holders of equity.

This report considers evidence relating to each of these in the case of the UK and their potential implications for short-termism compared to other countries in Sections 6-12.

Prior to that, Sections 3-5 assess innovation performance, fixed capital formation performance and R&D in manufacturing in the UK in an international comparative framework.

3. Innovation Output

3.1 Measuring Innovation Output

The multi-dimensional nature of innovation means that comparisons of innovation performance across economies can require comparisons of multiple indicators. The Global Innovation Index for example is based on five 'input pillars' (institutions, human capital and research; infrastructure, market sophistication and business infrastructure) and two 'output pillars' capturing knowledge and technology outputs and creative outputs). These are then 84 sub-pillars within these (Dutta and Lanvin, 2013). The EC Innovation Union Scoreboard 2013 is somewhat simpler. It distinguishes between three main types of innovation indicator and eight innovation dimensions. This produces a total of 25 different indicators ranging from innovation enablers, through firm activities, to innovation outputs. Innovation outputs incorporate indicators of the number of innovators (with sub-categories for: the number of small or medium-sized enterprises with product or process innovations; the proportion with marketing or organisational innovations; and the proportion of high-growth

innovative firms in an economy). Output related indicators also include estimates of employment in knowledge intensive activities, the contribution of medium and high-tech sectors to the trade balance, the role of knowledge intensive service sectors in exports, and the extent to which the sales of firms are characterised by new to the market and new to the firm innovations; and, finally, the extent of licensing and patenting revenues from abroad (European Commission, 2013a).

Analyses of this kind usually place the UK in the category of innovation "followers" ranked behind the Nordic economies and Germany which are classified as innovation leaders (BIS, 2011b)[3]. Thus, in the EU Innovation Scoreboard rankings for 2013, the UK ranks 9th out of the EU 27 (European Commission, 2013a, Figure 2, p.5). The UK has also been a moderate grower in terms of changes in innovation performance amongst the innovation follower group. It lags behind the Netherlands and France in this respect, but ranks ahead of Belgium, Luxemburg, Austria and Ireland (European Commission, 2013a, Table 2, p.12)[4].

The most recent attempt at focusing attention on innovation output and identifying a narrower group of consistent and key indicators has been made by the European Commission (European Commission, 2013b). They propose an indicator which consists of four components. The first component is technological innovation as measured by patents. These are taken to represent the ability of the economy to transfer knowledge into technology. The indicator used is the number of patent applications per billion of GDP. The second component focuses on the number of persons employed in knowledge intensive activities as a ratio to total employment. This is interpreted as a proxy for the innovative content of output. The third component focuses on the competitiveness of knowledge intensive goods and services. It combines in equal weights first the contribution to the trade balance of high-tech and medium-tech manufacturing products and second the contribution of knowledge intensive service sectors as a share of the total services exports of a country. These are taken to reflect respectively the extent of the export of manufacturing products with high value added and the ability to take part in knowledge intensive global value chains. The final and last component of the composite indicator attempts to identify employment in fast growing firms in innovative sectors. This indicator is based on the identification of the level of innovativeness of sectors and employment growth in those sectors. This is used as a proxy for distinguishing innovative enterprises *per se* for which adequately consistent cross-country data is not available.

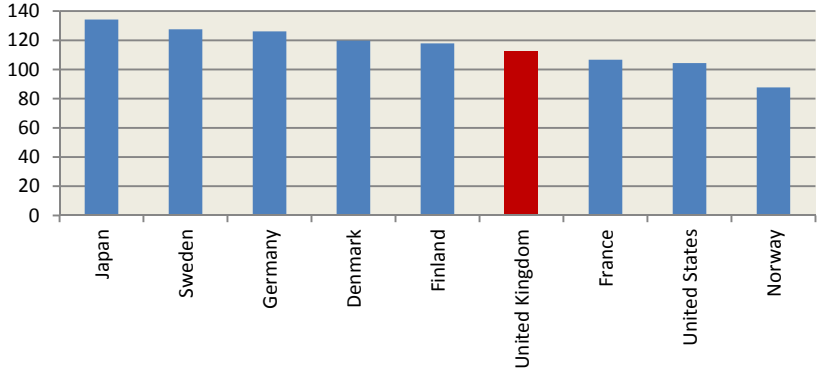
Neither the wider EC Scoreboard indices nor the more narrowly focused innovation output composite measures have a specific focus on manufacturing.

However, the most recent composite indicator does identify the contribution of medium- and high-tech manufactured products to the trade balance.

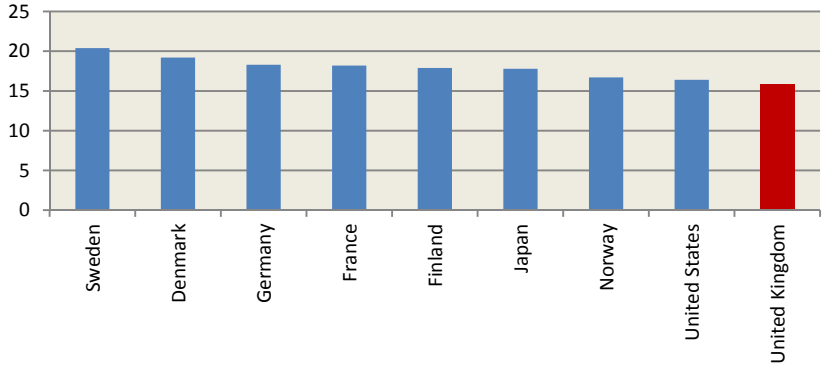
Exhibit 6 (a)-(d) presents innovation output performance data based on the latest composite output indicator. The comparator countries are, by the Foresight Programme for which the data is available. The UK appears from this exhibit as a moderate performer in terms of each of the indices shown. It is notable that on each of these measures economies which are typically classified as in the co-ordinated market economy group appear at the top end of the indicator spectrum whilst the UK and the US appear as moderate performers. The poor performance of the UK in terms of the contribution of medium- and high-tech manufacturing products to the trade balance is particularly striking in relation to Germany and Japan. The UK also lags France in this respect. At first blush these data suggest that the UK and LME type economies have weaker overall innovative performance.

Exhibit 6 UK Innovation Performance 2010-11

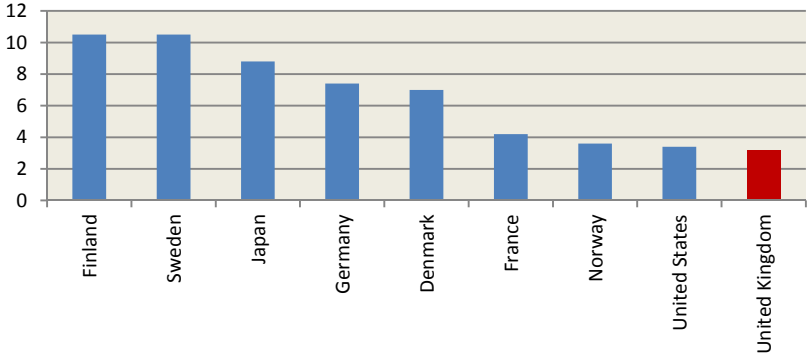
(a) Innovation output Composite Measure[5] (EU 2010=100)



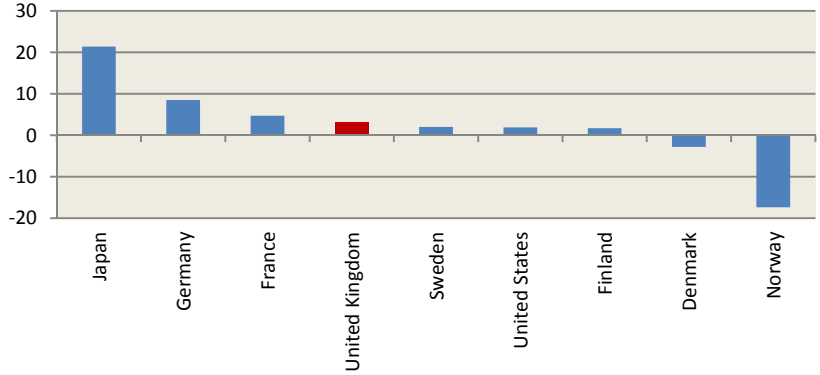
(b) Employment in fast-growing firms in innovative sectors as a % of total employment in fast-growing firms (2010)



(c) Number of PCT patent applications per billion GDP, PPP (2009)



(d) Contribution of medium and high-tech products to trade balance (2011)



Source: EC (2013)

3.2 Radical versus Incremental Innovation

So far the discussion has focused on measures of innovation output without addressing the nature of the innovation *per se*. The varieties of capitalism literature in particular has, as we have seen, been used to argue that coordinated market economies will be characterised by radical innovation and coordinated market economies will be characterised by incremental innovation. In the case of the UK the implication is that the UK will do relatively well at radical innovation and relatively badly at incremental innovation whatever its overall level of innovation output.

A major problem in assessing the evidence in relation to this proposition is how to make an operational distinction between radical innovation and incremental innovation.

Two broad approaches have been adopted to classify country innovation patterns. One is based on the intensity of patenting across sectors or on the types of patents used. The other is based on patterns of output or export specialisation across industries classified as Hi-Tech or Medium-Tech (based primarily on the intensity of their R&D or technical labour force characteristics). These are then taken to correspond to radical and incremental innovation respectively.

Patent Based Studies

Akkermans et al. (2009) use patent data to form several indicators of the radical or incremental nature of innovation. Following Trajtenberg (1990) and Trajtenberg et al. (1997) they propose three ways of measuring 'radical innovation'. The first is simply the number of patents citations received, the second (generality) is a measure of the numbers of different patent classes which cite a patent, and the third (originality) is a measure of the diversity of patents cited in the patent application[6]. This patent data and set of measures are analysed in aggregate and at the level of individual industries. They group 22 economies using Hall and Soskice's 2001 classification into LMEs, CMEs, and Mediterranean market economies (MMEs). The latter is defined as featuring strong reliance on non-market mechanisms and corporate finance alongside a focus on market mechanisms in labour relations. This group includes France, Greece, Italy, Portugal, Spain and Turkey. The UK is in the LME group. Their results confirm the hypothesis for the manufacturing sector as a whole that LMEs are relatively more specialised in producing "original" innovations with diverse patent citations. These results would suggest that as an LME the UK would be expected to be relatively more involved in innovation based on combining multiple sources of knowledge compared to other non-LME economies. However, this overall result conceals divergences form the predicted LME/CME bifurcation when individual industries are analysed. The aggregate result is confirmed in relation to chemicals and related products and electronics industries.

In metals, machinery and transport equipment industries, however, the CMEs outperform the liberal market economies in terms of "original" innovation. Fewer differences of significance were found using measures of radicalness emphasising "generality" of application or the number of citations.

Griffith and Macartney (2012) focus on the employment protection aspect of the varieties of capitalism literature and its impact on radical versus incremental innovation. They do not consider financial aspects, but they do focus on patenting and are interested in the two edged nature of employment protection legislation. High employment protection legislation may increase firm specific investment in human capital and hence have a positive impact on incremental innovation. On the other hand by increasing the costs of laying off labour in the face of variations in future demand it may inhibit 'radical' innovation which is seen as more likely to produce unpredictable effects. To test the net outcome of these influences they examine the patenting behaviour of a large sample of subsidiaries of multinational corporations in Europe. Their analysis covers the period 1997-2003 and the sample contains 1,084 subsidiaries of 231 multinational firms in 12 countries (80% of the subsidiaries are in France, Germany and the UK and they account for a similar proportion of the patent applications filed). They make a distinction between the number of patents as a measure of incremental innovation and the proportion of patents which cite non-patent literature (i.e. make references mainly to scientific journals and the science base) as a measure of radical innovation. Their argument is that the latter category of patenting involves greater uncertainty and therefore should be negatively related to employment protection legislation. Their results are consistent with employment protection legislation supporting incremental innovation by encouraging firm specific investment, but discouraging more radical innovation, which is negatively correlated with employment protection legislation. They interpret this as a reaction by firms to the higher lay-off costs associated with adjustments in the face of potential failures of more radical innovation. The results, however, are somewhat sensitive to the inclusion or exclusion of the major economies in the sample. Thus when the UK is removed from the analysis, the results become statistically insignificant. When France is removed, the incremental innovation variable changes sign and becomes insignificant. On the other hand the removal of Germany does not alter the overall pattern of results. Possibly confounding or complementary effect of financial markets are not considered whereas in the two previous studies discussed they were included in classifying economies.

Revealed Comparative Advantage

Allen et al. (2006) compare indicators of revealed comparative advantage[7] across a large sample of finely disaggregated sectors in 22 OECD economies. They group the economies according to Hall and Soskice (2001b). They group the sectors into those previously identified in the varieties of capitalism literature as predisposed to incremental or radical innovation. Some results are shown in Exhibit 7 for incremental innovation sectors and in Exhibit 8 for radical innovation sectors. Whilst there is some broad support for the hypothesized groupings, there are notable exceptions. Thus, Japan ranks highly in some radical and incremental innovation sectors and so does Germany. The US also performs relatively well in some of the "incremental" as well as "radical" sectors. This suggests a very loose set of correlations between varieties of capitalism and innovation type, at least as characteristics by the industry groupings.[8]

Exhibit 7 Comparative advantage in sectors characterised by incremental innovation, 2002

	Non-electrical machinery	Electrical machinery	Communications equipment & semiconductors
Country	**Rank**	**Rank**	**Rank**
Panel A: 'co-ordinated market economies'			
Germany	1	3	14=
Japan	3	1	1
Switzerland	4	4	14=
Austria	5	6	12=
Sweden	7	8	5=
Denmark	9	16=	8=
Finland	12	11=	5=
Netherland	13	14=	7
Belgium	14	16=	12=
Norway	20	20	21=
Panel B: 'liberal market economies'			
USA	6	2	2
UK	11	9	3
Canada	15	22	8=
New Zealand	16	14=	17=
Australia	21	21	14=
Ireland	22	16=	4
Panel C: unclassified coutries4			
Italy	2	7	21=
France	8	5	8=
Spain	10	10	17=
Portugal	17	11=	8=
Greece	18=	16=	18=
Turkey	18=	13	17=
TOTAL No. Countries	22		
TOTAL No. Sub-sectors in analysis	377	126	36

Source: Derived from Allen, Funk and Tüselmann (2006) Table 1, p.10.

Exhibit 8 Comparative advantage in sectors characterised by radical innovation, 2002

	Aerospace	Computers	Pharmaceutical	Scientific instruments
Country	**Rank**	**Rank**	**Rank**	**Rank**
Panel A: 'co-ordinated market economies'				
Germany	5	9=	8=	3
Austria	6=	15=	11	11
Switzerland	8=	12=	1	2
Denmark	11=	9=	8=	10
Japan	11=	4	15=	4
Sweden	11=	6=	13	9
Belgium	16=	21=	6	17=
Finland	16=	15=	21	12
Netherlands	16=	2	7	8
Norway	16=	15=	17=	13=
Panel B: 'liberal market economies'				
USA	1	1	4=	1
UK	3	3	2=	5
Canada	4	12=	22	15
Australia	8=	6=	17=	13=
Ireland	11=	5	4=	17=
New Zealand	11=	15=	15=	21
Panel C: unclassified countries				
France	2	8	2=	6
Italy	6=	9=	10	7
Spain	10	14	12	16
Greece	16=	15=	14	20
Portugal	16=	15=	17=	19
Turkey	16=	21=	17=	22
TOTAL No. Countries	22			
TOTAL No. Sub-sectors in analysis	13	28	45	126

Source: Derived from Allen, Funk and Tüselmann (2006) Table 2, p.12.

The UK is in Panel B of each exhibit and confirms well to the expected pattern in terms of radical innovation. Thus in high tech sectors it is third ranked in revealed comparative advantage in aerospace and computers, joint second in pharmaceuticals and fifth in scientific instruments. The pattern for incremental

innovation is less clear. Thus the UK ranks mid-table in non-electrical machinery and electrical machinery (11th and 9th respectively) which is consistent with the variety of capitalism hypothesis, but is 3rd in communications equipment which is inconsistent with the varieties hypotheses.

In a later study Schneider and Paunescu (2012) also use a revealed comparative advantage approach. They analyse 26 OECD countries over the period 1990 to 2005. Using the country classification shown in Exhibit 3 above they examine the relationship between the groupings and comparative specialisation in terms of High-tech and Medium High-tech export intensity.[9] It is clear from their data that economies may change over time in the relative extent to which they export high technology goods, and thus the extent to which they may be characterised as radically or incrementally specialised economies. However, when they pool their cross section data for 1990, 1995, 1990 and 2005, they report regression results in which LME economies, such as UK, are shown as having a revealed comparative advantage in the high tech sector compared to CME (and State Dominated) countries. They have a revealed comparative disadvantage in medium high tech compared to CMEs alone. These differences are both statistically and economically significant.

Taken as a whole these results based on patenting and revealed comparative advantage are broadly consistent with the relative radical incremental specialisation between LMEs and CMEs hypothesized in the literature. There are, however, considerable overlaps in terms of disaggregated sectoral results. Thus the discussed examination of detailed sector patterns of, for example, patenting) reveal that (even taking these patent proxies at face value) CME economies in many cases demonstrate comparative advantages in radical as opposed to incremental innovation (see, for example, the detailed discussion in Akkermans et al., 2009). In general in the case of the UK the evidence is broadly consistent with a relative emphasis on radical innovation.

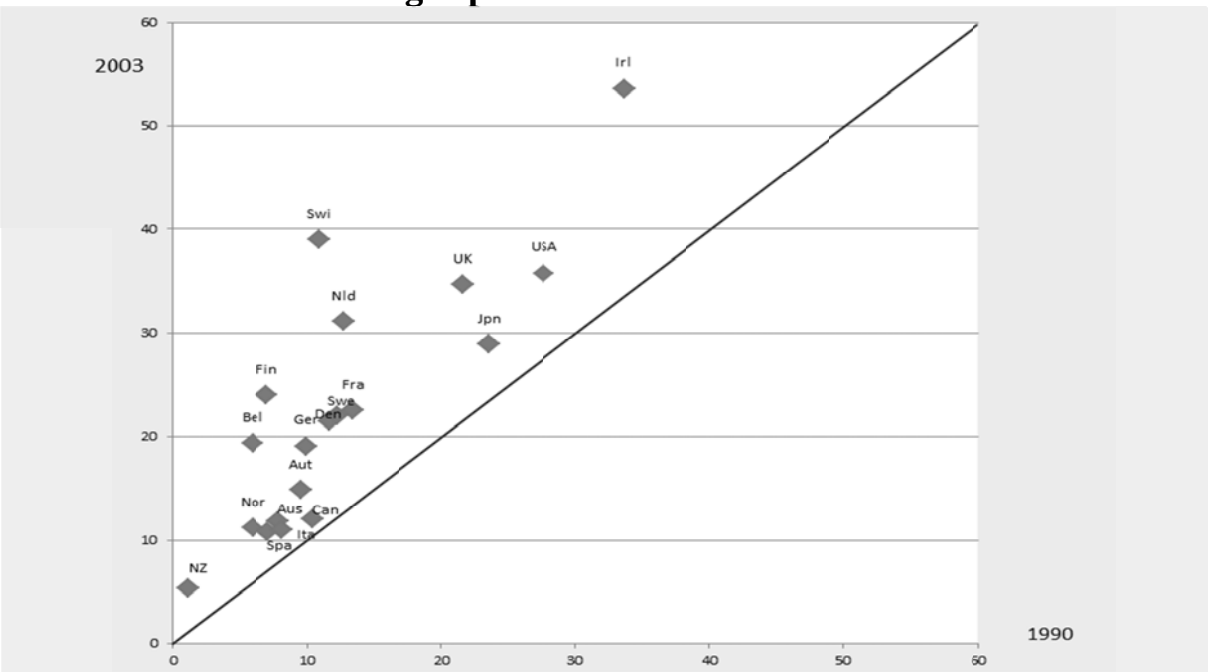
However, these studies say little about the overall absolute innovative performance of the UK compared to other countries on either type of innovation. We have seen that in terms of overall innovation the UK is a follower economy and a relatively weak performer. Moreover a relative advantage in radical innovation does not mean the UK has an absolute advantage.

Comparative and Absolute Advantages

The fact that the UK has a "comparative advantage" in radical innovation does not, of course, mean that as a system it is absolutely better at carrying out or financing radical innovation than, say, Germany. In fact as Exhibit 9 (based on Schneider et al. (2010)) shows there has been over time an increase in *all* the major OECD economies in exports of high-tech industries as a share of total manufacturing exports. Irrespective of the variety of capitalism, it is clear that across a wide range of economies it has been possible to increase exports in these "radically" innovative sectors. In the case of economies such as Switzerland, the share of such exports rose fourfold between 1998 and 2003. Moreover, in Germany (a supposedly "incremental" specialised innovative economy) the share doubled.

The fact that countries can raise their share of high-tech activity and the share of such exports in their overall activity shows that both LMEs and CMEs are capable of making such transitions and that the latter may be absolutely superior in both. Thus other organisational and networked based approaches to innovation performance have argued that the tight interconnections in coordinated economies such as Japan and Korea have been central in the past to their ability to outperform US firms in radical innovation rather than inhibit them (Aoki, 1988; Hager and Hollingsworth, 2000, Nonakka and Konno, 1998).

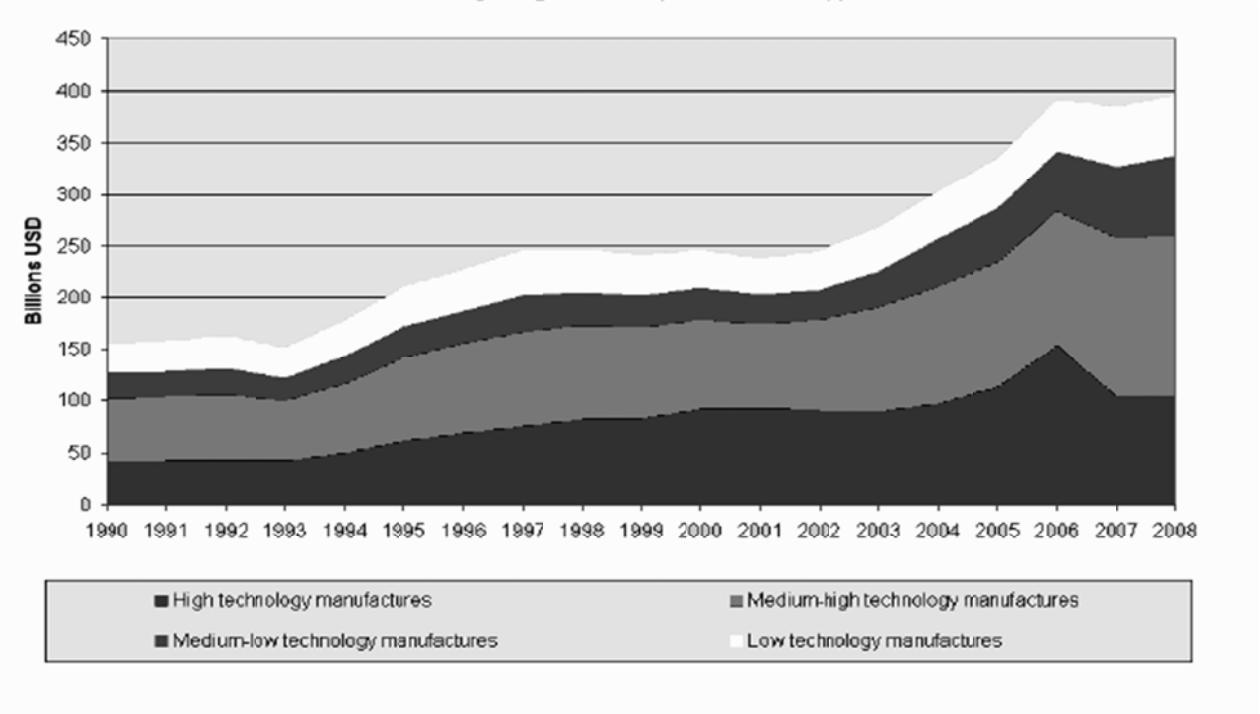
Exhibit 9 Percentage of exports in high-tech industries as a share of total manufacturing exports in 1990 and 2003



Source: Derived from data in Schneider et al. (2010) Table 1 p.253

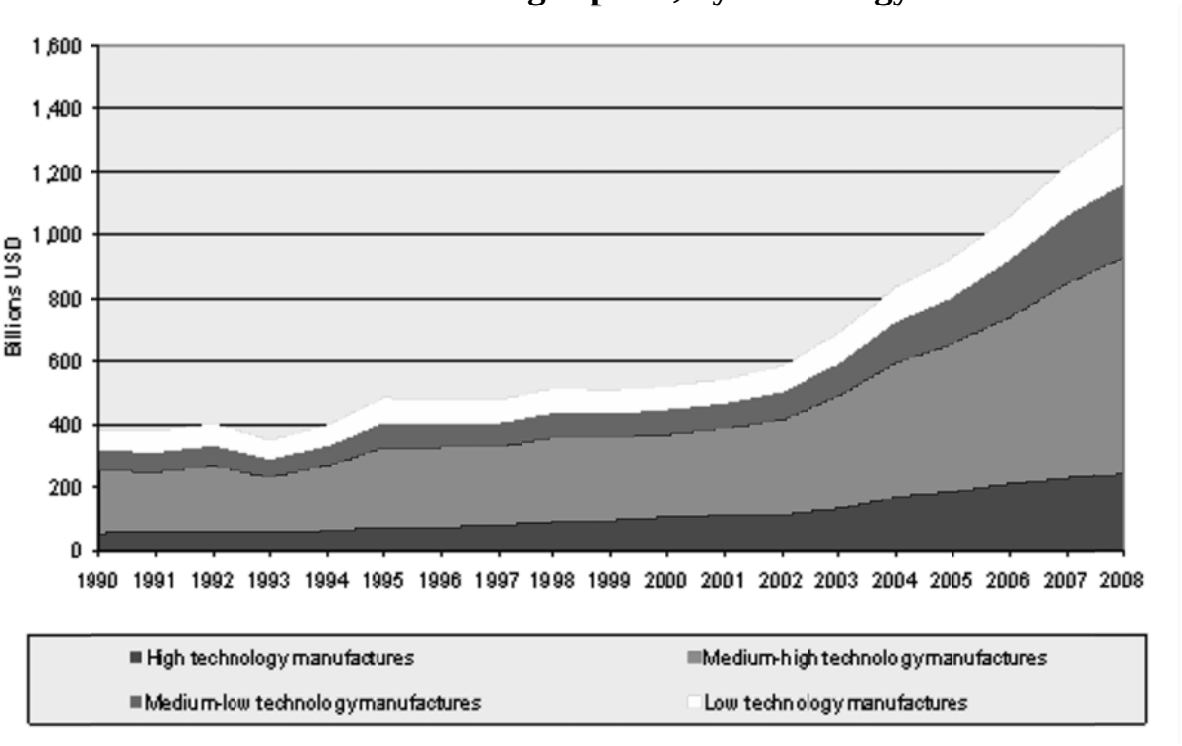
The importance of looking at absolute measures of performance is brought out most directly if we compare the UK and Germany in terms of the technology intensity of exports. This is done in Exhibits 10, 11 and 12 drawn from Kneller (2012).

Exhibit 10 UK manufacturing exports, by technology 1990-2008



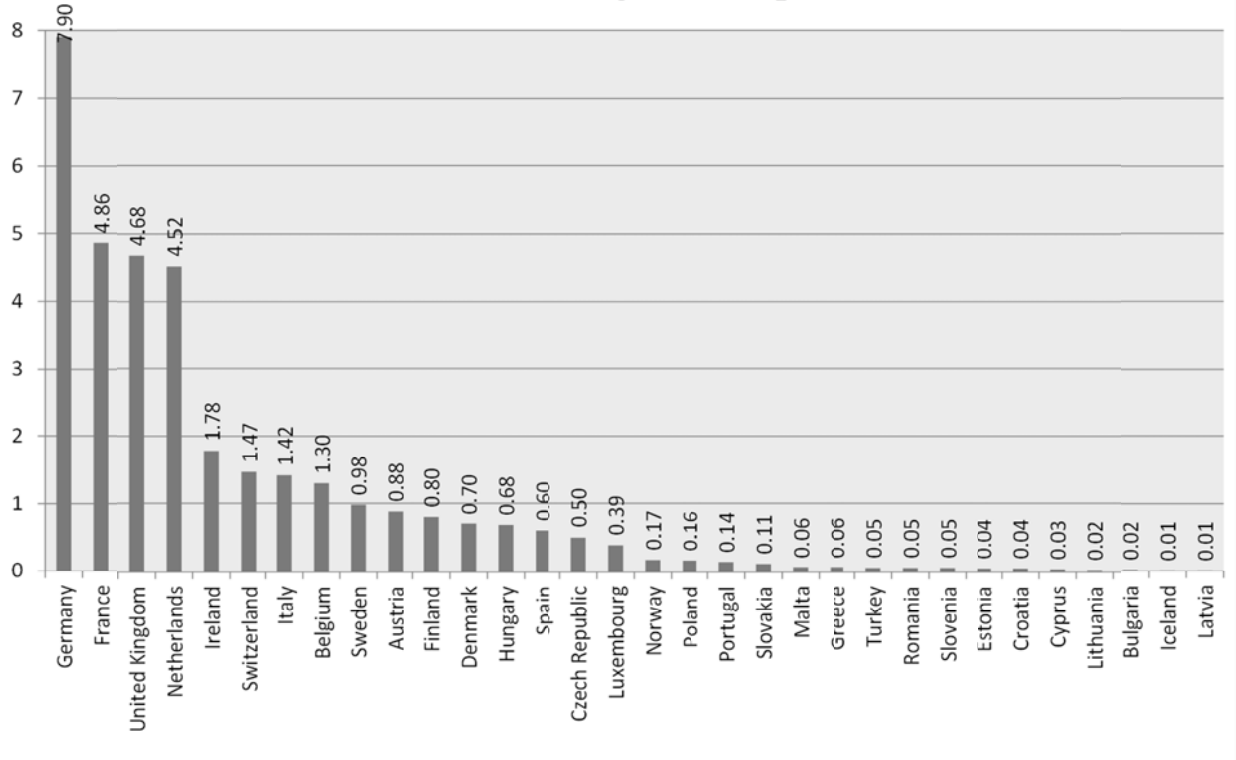
Source: Kneller (2012)

Exhibit 11 German manufacturing exports, by technology 1990-2008



Source: Kneller (2012)

Exhibit 12 World market shares of high-tech exports for EU member states



Source: Eurostat (2008)

The exhibits show the shares of manufacturing exports of different levels of technological intensity in the UK and Germany and the share of each in total world trade. A visual comparison of Exhibits 10 and 11 reveals that the UK has a higher share of high-tech exports in its overall manufacturing exports and that this has been growing over time. A glance at the left hand scale of each exhibit also reveals, however, that the German economy produces an order of magnitude greater volume of high-tech manufacturing sector exports compared to the UK. As a result, if we look at world market shares of high-tech exports, Germany is easily the leading EU economy in this respect. The German variety of incremental innovation capitalism does not inhibit the German economy from being an exceptionally powerful competitor in these 'radical' high-tech sectors. This is not consistent with the view that the German coordinated market economy inhibits "radical" innovation (insofar as high-tech exports are taken as a proxy for that characteristic) or that the UK LME system promotes it.

3.3 Radical v. Incremental Innovation: An unhelpful distinction?

The usefulness of making links between varieties of capitalism or financial systems and radical and incremental innovations as measured by the proxies used above is questionable when the insights arising from the study of innovation *per se* are considered. In this wider innovation literature radical innovations are most often defined in terms of fundamental shifts in the relationship of performance to price; the development of new industries, products or processes, and/or the pervasiveness of their effects across sectors. They are also linked to fundamental organisational changes *within* firms as well as between them. Radical innovations are, however, also frequently associated with subsequent long processes of incremental innovation within the firms and sectors where they occur. This makes simple binary classifications of sectors questionable (Fagerberg, 2005; Verspagen, 2005; Powell and Grodal, 2005; Sorescu et al., 2003; McDermott and O'Connor, 2002).

Salter and Alexy (2013) provide a useful overview. They point out that where detailed attempts have been made to measure the frequency of radical innovations, it appears that they may take decades to develop and are extremely infrequent, maybe occurring once in every three decades (Anderson and Tushman, 1990; Tushman and Anderson, 1986; McDermott and O'Connor, 2002). The implication is that in the average industry firms may operate and workers may work their entire lives without ever experiencing a radical innovation. Moreover, it appears that such innovations are best thought of as not specific to certain sectors and therefore not easily revealed in patterns of relative comparative advantage across sectors. Instead they are pervasive across many

sectors, i.e. that they are what are known as general purpose technologies (Helpman, 1998).

It also appears to be the case that appropriating the value from radical innovations when they do occur depends critically upon the ability to implement and develop competitive strategies around substantial investment in incremental innovation. This has led to the emergence of a substantial literature on sectoral systems of innovation. This eschews simple twofold binary distinctions between sectors and their innovation systems. Instead it favours a more granular approach emphasising, inter alia, the interplay between technological opportunity and appropriability conditions (i.e. how a value is captured by businesses). It also emphasises the way in which the nature of a sectoral system and the types of innovation it embodies can vary over time (Malerba, 2004 and 2005). Competition and competitive advantage shifts from 'radical' product innovation to 'incremental' product and process competition over a sector life cycle (Utterback, 1994). This has more to do with the maturity of a sector than its 'high-tech' status. There is also abundant evidence to suggest that sectors which are classified as low-tech are also characterised by innovations of a transformative or radical kind (see, for example, the discussion in Von Tunzelmann and Acha (2005). A particularly striking example here is the role of information technology in transforming business models and productivity in retailing and wholesaling in the United States in particular as well as in other economies.

It is also apparent that innovation in general is increasingly influenced by the pursuit of open collaborative and networked models. Rather than emphasising a contrast between liberal markets and coordinated markets this suggests a cross national move towards more inter-firm collaboration arrangements (Chesborough, 2003 and 2006) in which CME economies may be at an advantage.

Aoki (2010) also argues that similar organisational 'architectures' are emerging in the world's leading businesses which are global in character rather than defined by national boundaries. Moreover, when more direct measures of innovation outputs rather than indirect measure such as patents are used it appears that company level variables dominate with few signs of country effects (see, for example, Tellis et al., 2009) (see also Streeck (2009) and Carlin (2009) more generally).

This suggests that discretions between radical and incremental innovation trajectories linked to 'national' system characteristics may not be a helpful framework in thinking through future innovation financing scenarios for the UK. These convergence issues are discussed further in Section 12 below.

4. Innovation Expenditure: Capital Investment, R&D and Other Intangible Investment

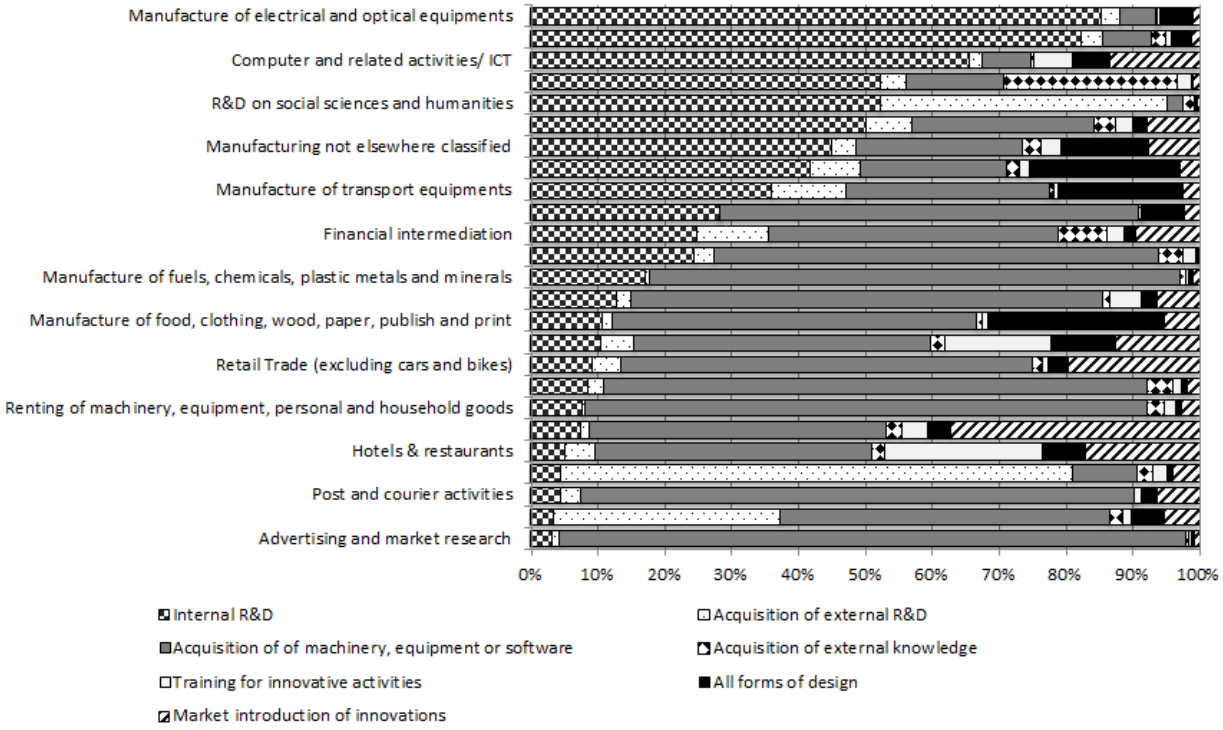
Given the UK's modest performance in terms of innovation output, it is appropriate to turn to the extent to which it engages in investment in assets to support innovation and which the financial system must fund.

4.1 Tangible and Intangible Expenditure in Support of Innovation

Expenditure to support innovation can be classified into a number of categories. Official survey data collected from business enterprises in the UK provides data on expenditure on R&D carried out internally by the company; external R&D and knowledge purchased from other external organisations; acquisition of capital equipment; training for innovation activities; design expenditure and expenditure on marketing innovation.

Exhibit 13 shows that in the case of manufacturing the two most significant categories of expenditure are internal R&D and the purchase of capital equipment, although their respective importance varies across individual sectors. In this section we therefore focus in turn on capital investment and R&D.

Exhibit 13 Shares of expenditure of UK firms' innovation-related activities by sector (2008-2010)



Source: Office for National Statistics (UK Community Innovation Survey 2009)

4.2 Capital Investment

An analysis of capital investment for the Foresight Programme on the Future of Manufacturing discusses capital investment in manufacturing in detail (Driver and Temple, 2012). We therefore briefly summarise their key conclusions here. They show that 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. The growth rate of the fixed capital stock was negative for the period 2000-07. For ICT investment, however, the trend was better and closer to that of other economies. They also show that the growth of capital per worker in manufacturing has been about the average of competitor countries, but that there is a large gap between UK manufacturing in terms of the capital shortfall to match the top EU 15 countries. Their analysis of overseas ownership shows that nearly one half of UK manufacturing investment (46.5% in 2009) and nearly a third of employment is accounted for by foreign owned multinational enterprise. Finally, they show that 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 Offer for Budget Responsibility in late 2012.

This suggests that the UK economy's moderate innovation performance is associated with a weak performance in terms of capital expenditure.

4.3 Investment in R&D

In this section we provide a more detailed overview of the UK R&D in an international comparative context. A sample of 11 countries is analysed which includes those which are most consistently referred to and analysed in the literature on comparative financial systems and includes the US, the Scandinavian economies, the UK, China, Japan, Korea, Germany and France. The exhibits revise and update those in Hughes and Mina (2012).

It is conventional in discussing R&D expenditure patterns to distinguish a number of categories of R&D expenditure. The first of these is Gross Domestic Expenditure on R&D (GERD). This represents the overall R&D expenditure effort and is broken down into three sub-categories. The first of these is Business Expenditure on R&D (BERD), the second is Higher Education Expenditure on R&D (HERD) and the third is the government's own direct expenditure on R&D (GovERD). It is possible within BERD and for some categories of expenditures to provide comparative analyses for manufacturing alone and we do this wherever possible in the following discussion.

In addition to analyses of the conduct of R&D expenditure, it is also possible to examine patterns of funding for R&D at a broad macro level. Thus each of the categories of expenditure, for example BERD or HERD, can be considered from the point of view of who funds their R&D by UK business itself, government, or overseas funders etc.). We therefore present data on government funding for BERD and overseas funding for BERD. We also provide data for the extent to which HERD is financed by flows of funds from the business sector. Each of these is relevant to an assessment of the impact of financial sources upon the scale and direction of the R&D effort across countries.

Finally, it is possible also to identify variations across countries in the extent to which businesses of different sizes account for the bulk of R&D and also to examine the distribution of government support for R&D expenditure by size of the firms receiving that support. Data on each of these aspects of the UK R&D effort is included in this section.

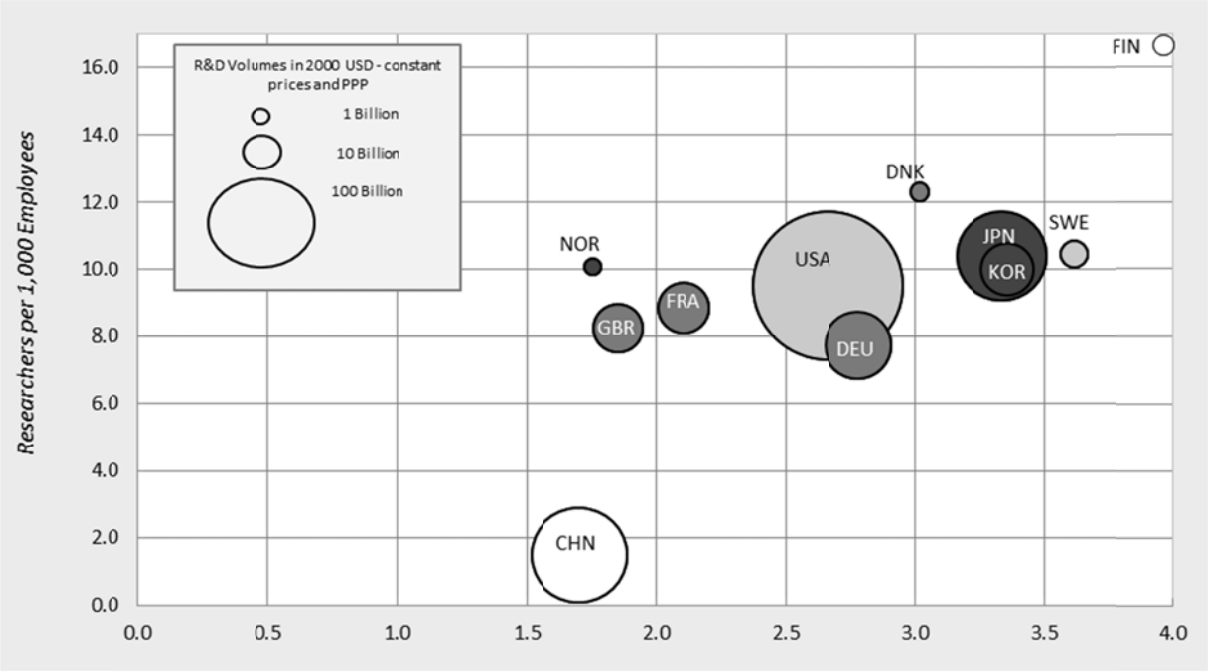
It is not always possible to provide a breakdown of expenditure of funding by manufacturing alone. However, as is shown below, manufacturing R&D is by far the largest component of overall R&D expenditure in the UK. Most of the trends

which apply to BERD also apply to manufacturing R&D as a sub-sector of BERD.

4.3.1 Gross Expenditure on R&D (GERD)

Exhibit 14 provides an overview of the relative position of the UK in terms of R&D expenditures (GERD). The data is shown as a percentage of GDP to allow comparisons across countries of different sizes. The exhibit also shows the number of researchers per 1,000 employees. In this and the following exhibits the data is for the latest year available. It is clear from Exhibit 14 that the UK is at the lower end of the spectrum in terms of R&D intensity and in terms of researchers per 1,000 employees. It is also substantially below Japan, the USA and China in the overall scale of its R&D effort (represented by the size of the balloons) and lags behind in absolute terms in relation to Korea, Germany and France. Although in the last case the difference is relatively small.

Exhibit 14 GERD: Gross domestic expenditures on R&D (as a % of GDP) and researchers per 1,000 employees, 2009 or latest available Year

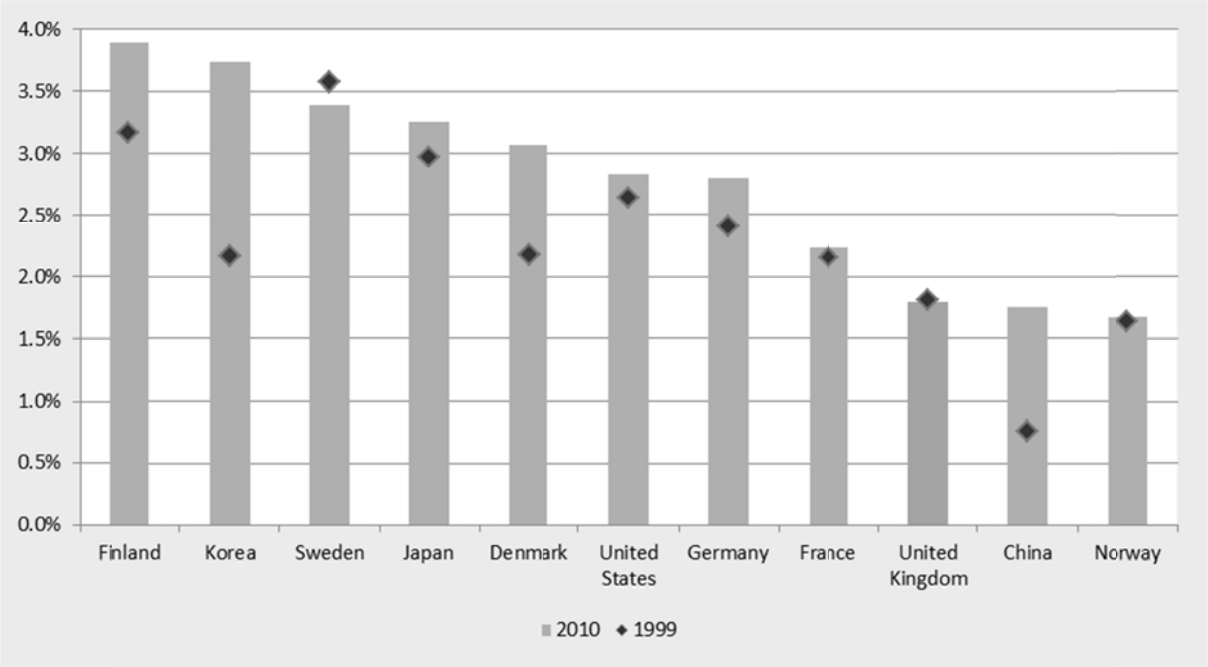


Source: OECD

Exhibit 15 shows the pattern of GERD across countries in 1999 and 2010. This shows that whilst the UK was at the lower end of the R&D intensity spectrum, it also suffered a small decline in GERD as a percentage of GDP whilst in the cases of Finland, Korea, Japan, Denmark, the US, Germany, France and China

increases occurred. The UK's position therefore worsened relatively to the majority of its international comparator countries.

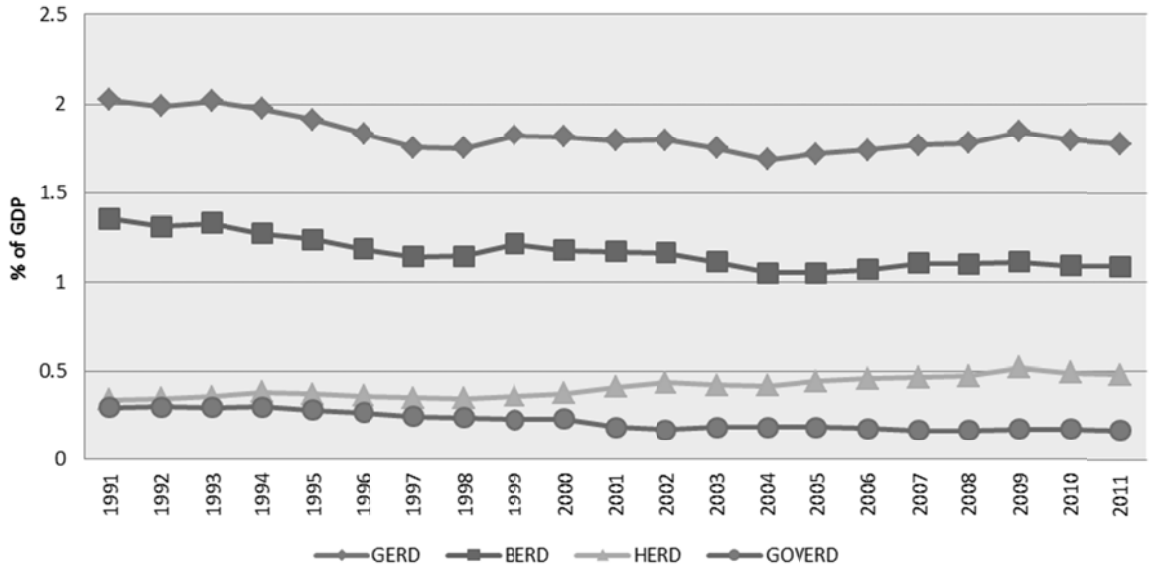
Exhibit 15 GERD: gross domestic expenditure on R&D, 1999 and 2010 (as a % of GDP)



Source: Authors calculations based on OECD STI database

This tendency for a weak and worsening R&D performance is revealed in Exhibit 16 which focuses on the UK alone and shows trends in the four aspects of R&D that were identified earlier. Thus it is apparent that in the course of the past 20 years the overall R&D effort has weakened and that this is mirrored in the weakening performance of BERD. Although there was some modest recovery after 2004 in BERD, this has not acted to offset the long-term decline. The only modest sign of improvement over the period is in the share of Higher Education R&D as a percentage of GDP. This has risen more or less in line with the trajectory set out in the 2004 10-Year Investment and Innovation Framework. This, however, reflects in part increased funding to cover the full economic cost of the R&D rather than an increase in the volume of HERD *per se*.

Exhibit 16 UK R&D expenditure as a percentage of GDP

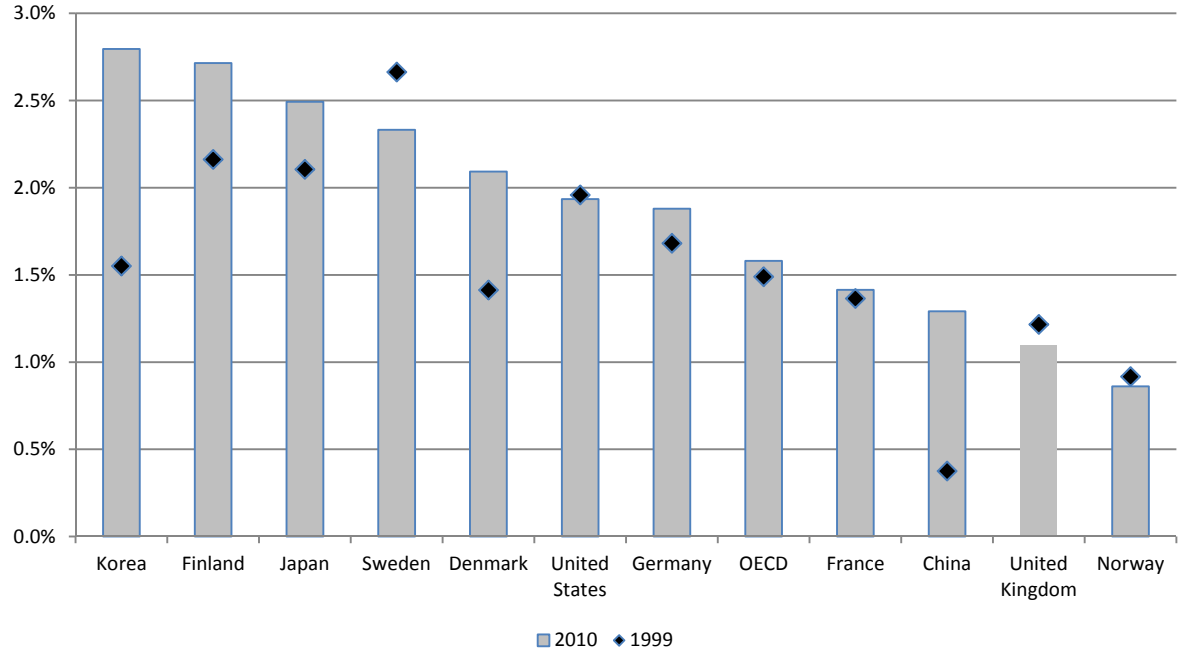


Source: Authors Calculations based on ONS data

4.3.2 Business Expenditure on R&D (BERD)

If we focus on BERD alone, Exhibit 17 shows once again that the UK is at the lowest end of the spectrum and has had a decline in R&D intensity in the business sector over the period 1999-2010. All of the other economies with the exception of Norway and Sweden have shown increases of varying significance. The US has basically marked time in this period. It could be argued that the weak and weakening R&D performance of the UK economy is a reflection of the fact that it is relatively dominated by low R&D intensive services sectors and/or that its relatively service intensive nature means that other forms of intangible investments besides R&D are relatively more important.

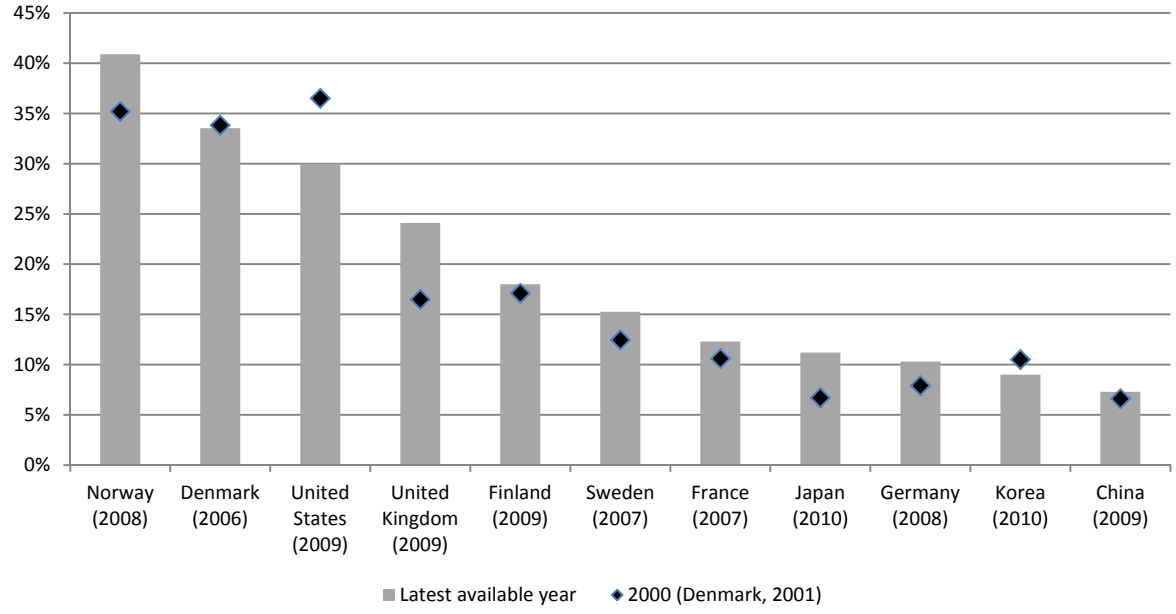
Exhibit 17 Business enterprise expenditure on R&D, 1999 and 2010 (as a % of GDP)



Source: Authors calculations based on OECD STI database

Exhibit 18 shows the share of services in overall business R&D in the UK and the comparator countries. The UK is fourth in terms of R&D in services and the share of business services rose between 2000 and 2009.

Exhibit 18 Share of services in business R&D, 2000 or latest available year

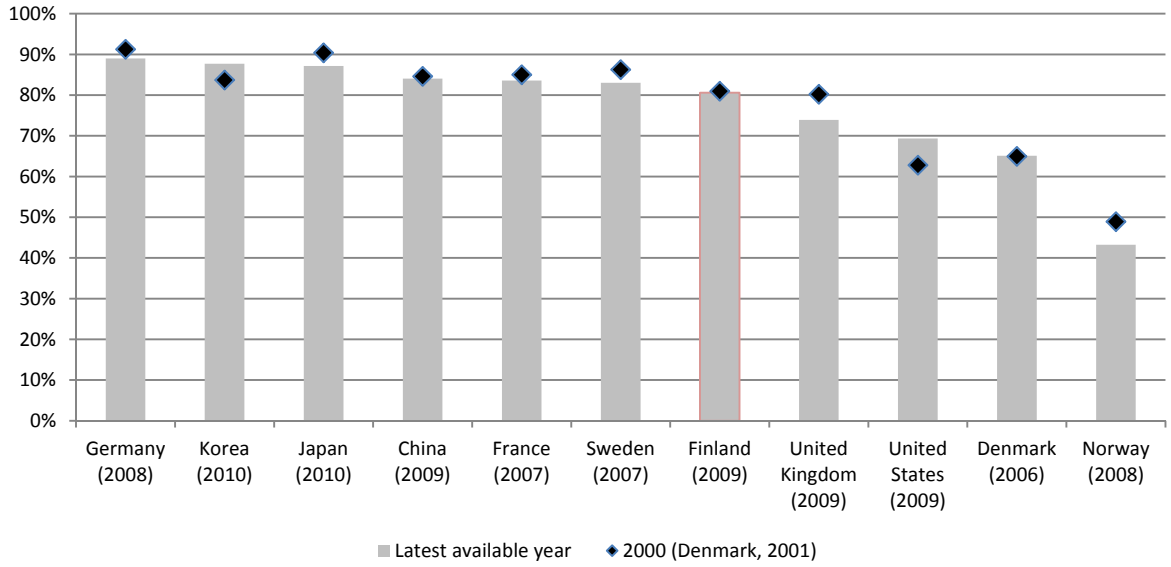


Source: Authors calculations based on OECD STI database

The counterpart to this is Exhibit 19. This shows that the UK was towards the lower end of the share of manufacturing in business R&D. the UK's overall performance may therefore simply be a compositional effect due to its relatively large services sector.

It is possible to correct the share of business R&D in an economy for differences in its industrial structure both between manufacturing and services and between more or less R&D intensive sectors within manufacturing.

Exhibit 19 Share of manufacturing in business R&D, 2000 or latest available year

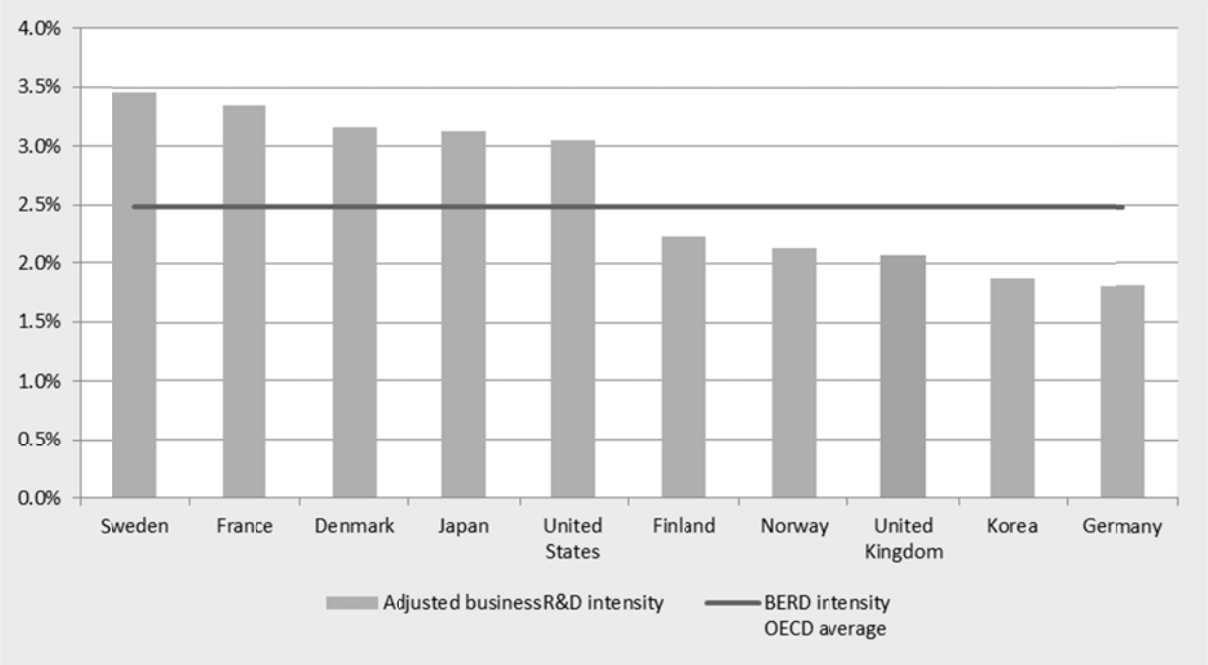


Source: Authors calculations based on OECD STI database

Exhibit 20 shows that when a comparison of business expenditure R&D is carried out which allows for those structural differences, the UK still remains a below-par player and is ranked third from the bottom on this adjusted basis. It thus appears that the UK remains a low R&D intensity economy, even when its service oriented structure is allowed for.

Finally, it is still possible to argue that R&D is perhaps not the best indicator of overall intangible asset investment or at least that it is not the only indicator to consider. It may thus be argued that if account is taken of other types of intangible investment, the UK might look better.

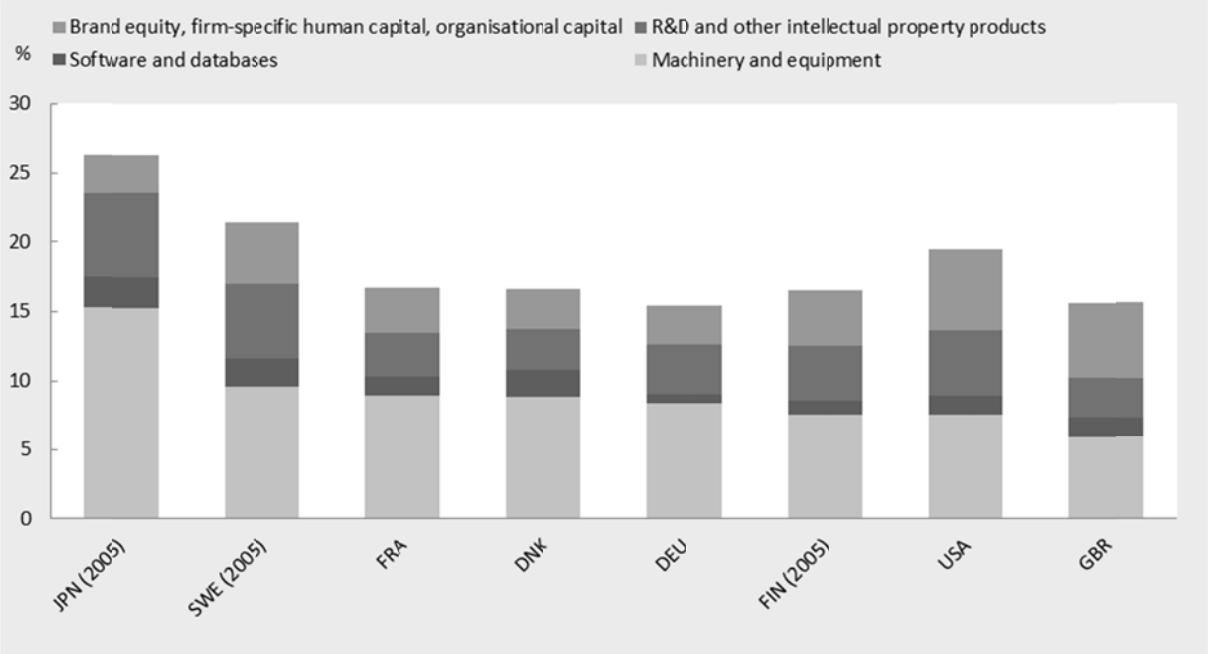
Exhibit 20 Business R&D intensity adjusted for industrial structure, 2008 (as a % of value added in industry)



Source: Authors calculations based on OECD STI database

Exhibit 21 provides a comparison of the UK with other economies in terms of investment in machinery and equipment; investment in software and databases; R&D and other intellectual property products; and brand equity, firm specific human capital and organisational capital. The exhibit ranks the countries from left to right in terms of investment in machinery and equipment (tangible assets). The UK's relative position is improved by its relatively high expenditure in non-R&D intangible assets. It still nonetheless comes joint bottom with Germany in this adjusted investment activity.

Exhibit 21 Investments in tangible and intangible assets as a share of GDP, 2006

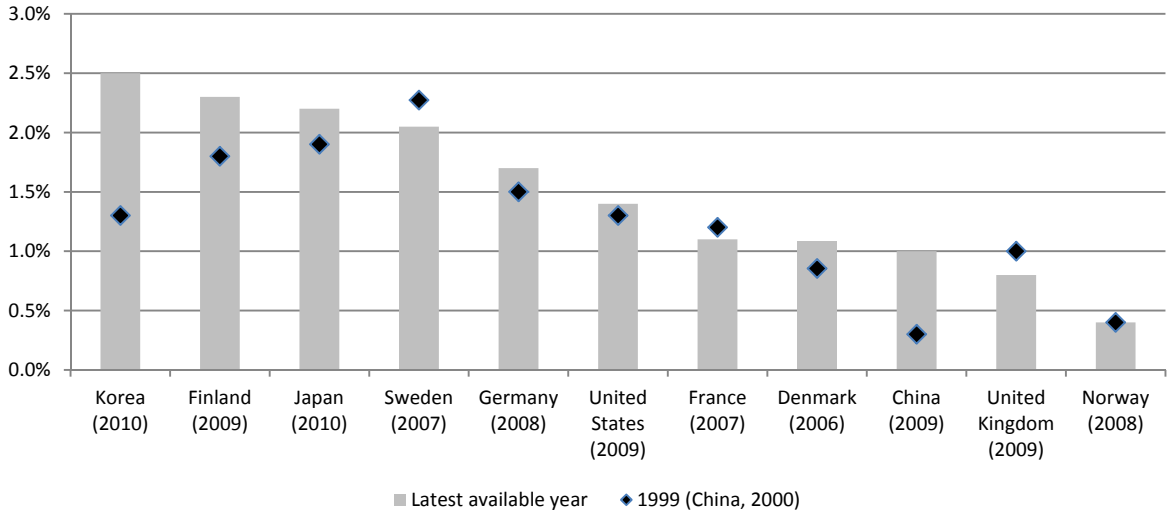


Source: OECD

4.3.3 Manufacturing R&D

Exhibits 22 and 23 focus on manufacturing R&D. The first shows manufacturing R&D, as a percentage of GDP in 1999 or/and the latest year available. The UK is bottom but one of this particular league table and UK manufacturing R&D as a % GDP share has fallen since 1999.

Exhibit 22 Manufacturing R&D as a percentage of GDP, 1999 and latest available year

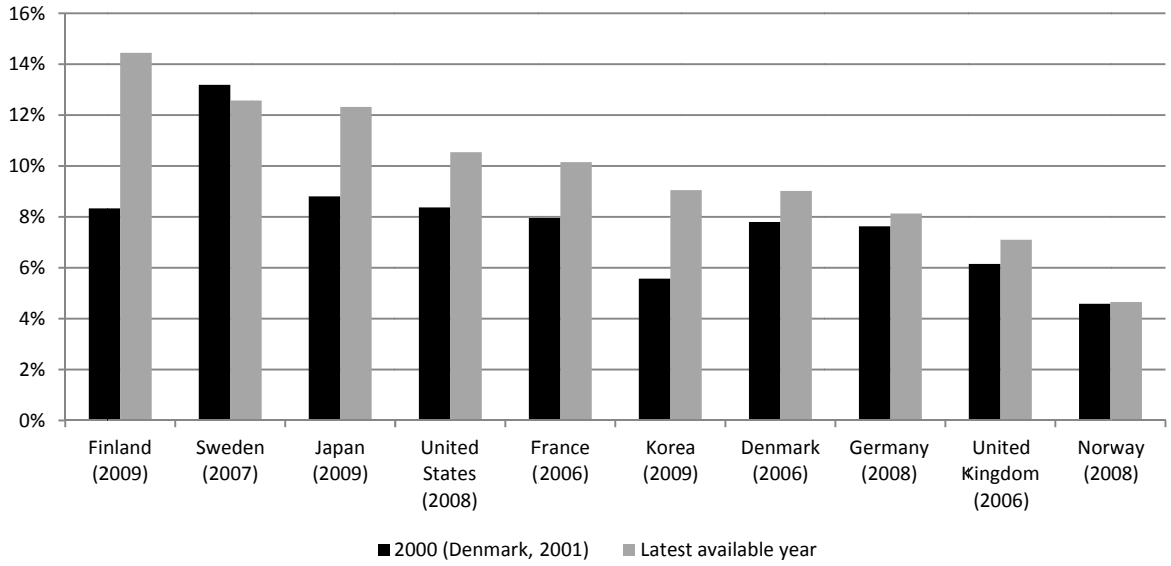


Source: Authors calculations based on OECD STI database

Exhibit 23 looks at R&D expenditures relative to value added in the manufacturing sector itself in the year 2000 and the most recent available. The data mostly relates to the period before 2009. The UK is once again at the bottom end of this league table and has experienced one of the smallest increases in R&D intensity within manufacturing amongst the comparator countries.

The UK thus appears to have a relatively low level of overall BERD. This performance has been weak or stagnant over time and is not primarily accounted for by differences in the UK's industrial structure. The performance of BERD in the UK manufacturing sector has been weak and it has amongst the lowest levels relative to manufacturing value added of the sample of companies analysed. The extent to which this might be accounted for by an unwillingness of its private financial system to invest in long-lived risky investment projects is examined later in this report.

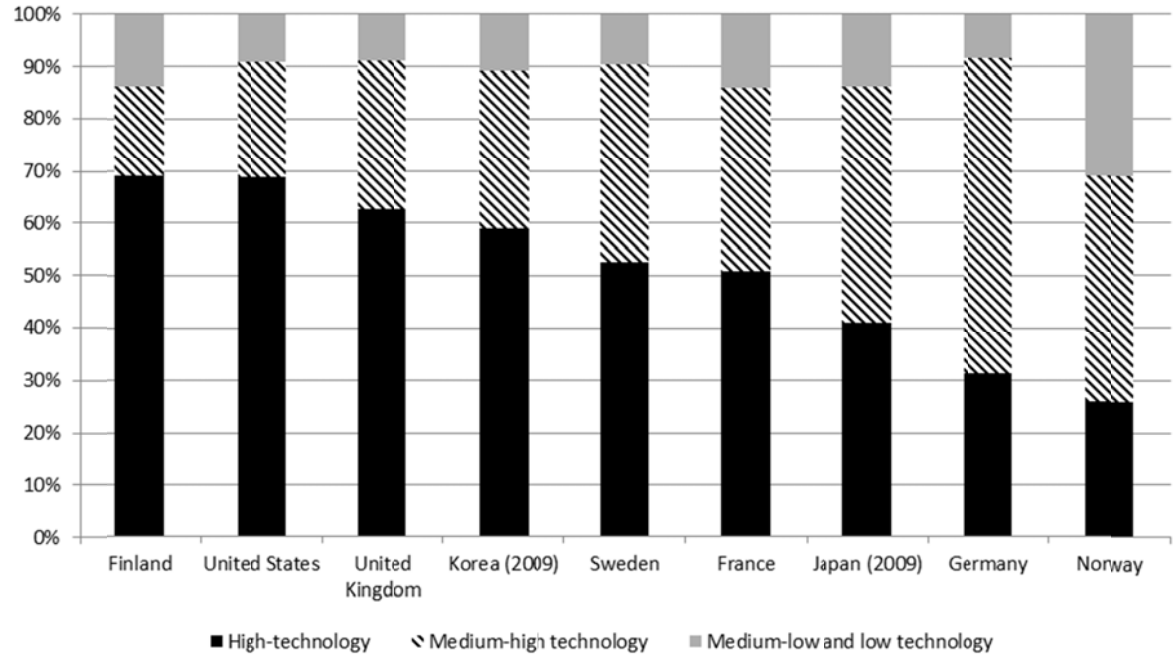
Exhibit 23 R&D intensity in manufacturing using value added, 2000 and latest available year



Source: Authors calculations based on OECD STI database

Exhibit 24 looks at the distribution of UK R&D across sectors within manufacturing. Where the sectors are defined in terms of the level of technological intensity (based upon their R&D/sales ratio or technical intensity of the labour force).

Exhibit 24 Business R&D in the manufacturing sector by technological intensity, 2008 (as a % of manufacturing BERD



Source: Authors calculations based on OECD STI database

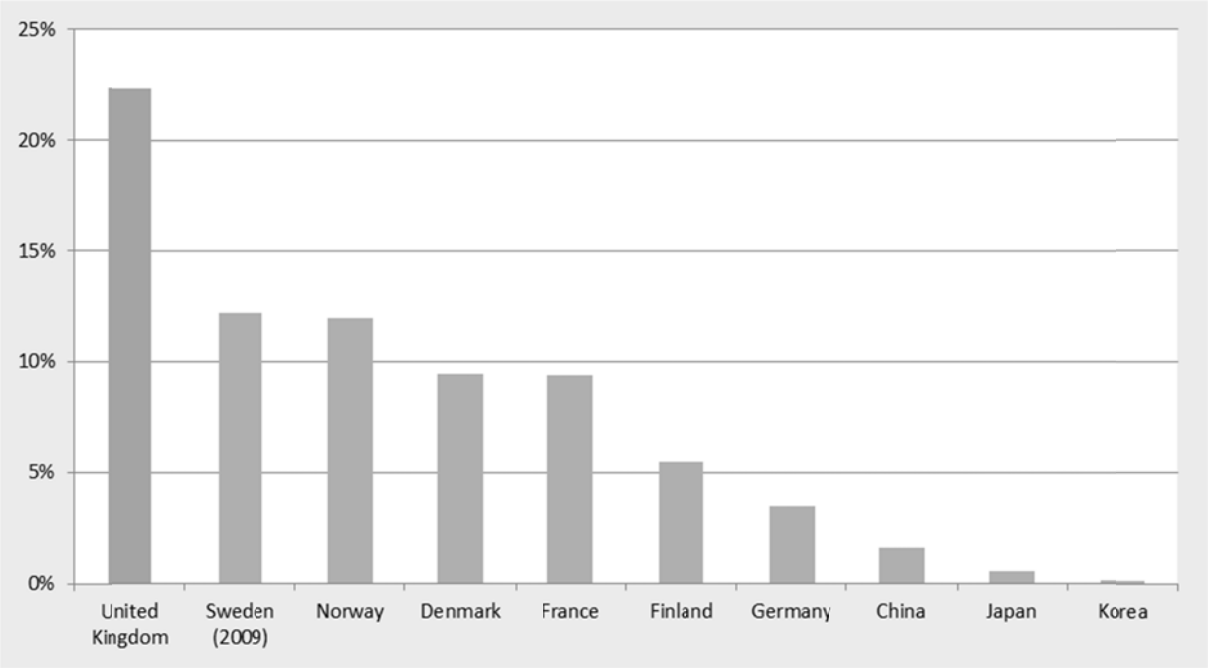
The exhibit shows that the United States and the UK have R&D relatively concentrated in high technology sectors whilst Germany is relatively concentrated in the medium to high technology sectors. Thus, column 1 shows that business R&D in the high technology sector as a percentage of manufacturing R&D is 68.9% in the case of the US and 62.8% in the case of the UK compared to 31% in the case of Germany. Equally, business R&D in medium high technology manufacturing sectors as a percentage of manufacturing R&D is over 60% in the case of Germany compared to 22% in the case of the USA and 28.3% in the case of the UK. Similarly, Japan, as an example of a coordinated market economy, has a somewhat higher share of its manufacturing R&D in the medium high technology sectors than in the high technology sectors, although the differences are much smaller than in the case of Germany. However, Korea is closer to the UK and France than it is to either Germany or Japan. The most high technology intensive economy in the sample as a whole is Finland. In each of these cases it is important to note the earlier finding that Manufacturing R&D as a percentage of GDP is much higher in Japan, Korea and Germany than in the UK. As a result the absolute level of high technology R&D in the UK was $10.6bn, whereas it was $16.3bn in Korea, $39bn in Japan and $13.5bn in Germany.

4.3.4 Foreign Ownership and Funding of UK R&D

The discussion so far has focused on R&D expenditure by sector rather than which UK sources of finance fund the R&D carried out and the nationality of business carrying out the R&D. Exhibits 25 and 26 therefore look at overseas involvement in the UK R&D effort. Overseas funding of R&D is one indicator of the internationalisation of the UK R&D effort. Another is based on the ownership characteristics of the businesses carrying out R&D expenditure in the UK. Exhibit 25 looks at funding *per se* and shows the extent to which business BERD in a particular country is funded from overseas sources. Exhibit 26 looks at the extent of overseas ownership of the companies carrying out R&D in the UK.

It is apparent from Exhibit 25 that the UK is an extreme outlier in terms of overseas funding. The proportion of UK BERD which is funded from overseas sources is twice as high as the nearest country shown in the exhibit and is around five times as high as is the case in Germany. Comparable data is not available for the United States. The exhibit also shows that overseas funding of R&D is negligible in the cases of Japan and Korea.

Exhibit 25 R&D funds from abroad, 2010 (as a % of business enterprise R&D)

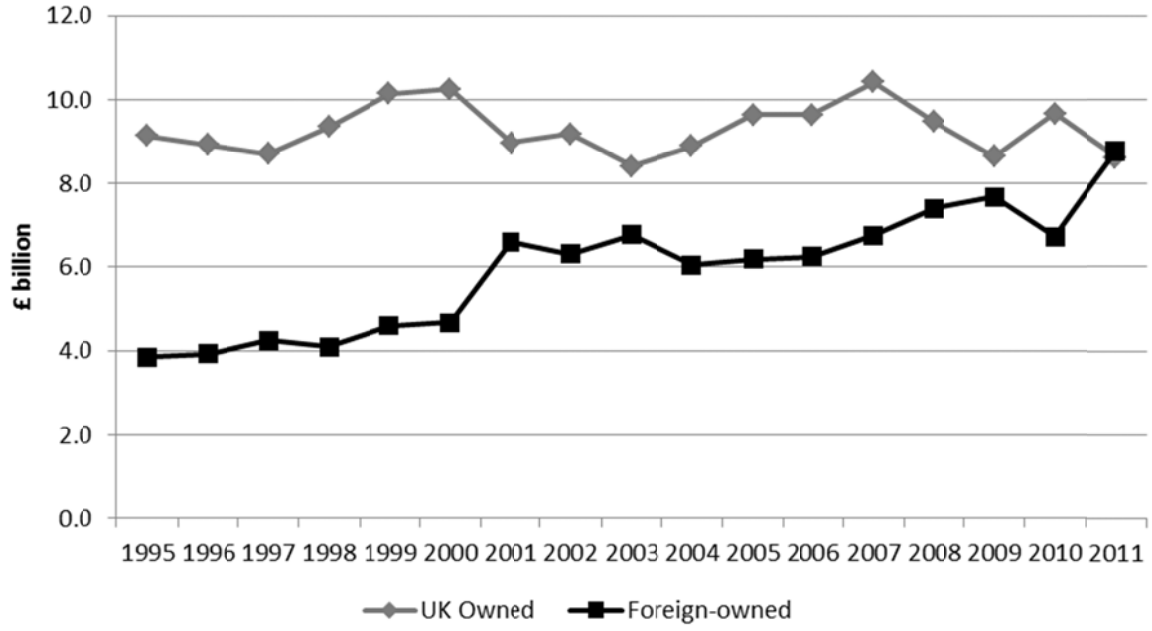


Source: Authors calculations based on OECD STI database

Exhibit 26 plots trends over time in R&D carried out in businesses which were UK owned and foreign owned respectively. Between 1995 and 2011 business R&D performed by foreign owned businesses more than doubled. Over the same period R&D carried out by UK owned businesses remained virtually stable. The

upshot was that in 2011 for the first time foreign owned businesses performed more R&D in the UK than UK owned businesses did.

Exhibit 26 Ownership of businesses who perform R&D in the UK (in 2011 prices)



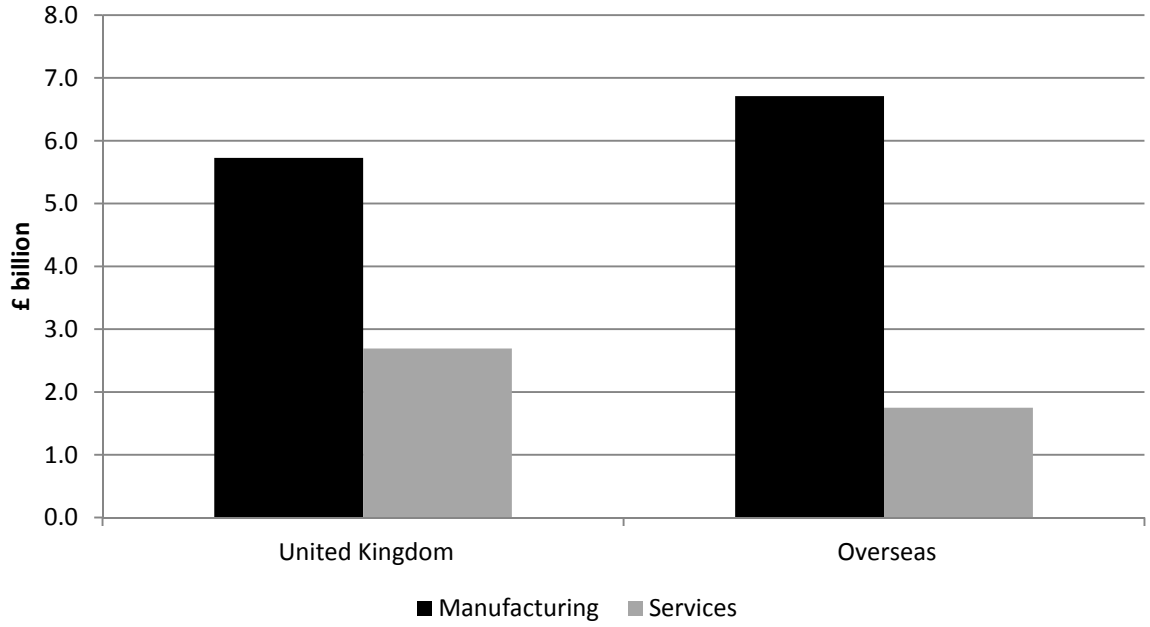
Source: ONS data

This changing importance for overseas owned businesses is even more striking in the case of manufacturing. Thus Exhibit 27 shows the distribution of R&D accounted for by UK owned and overseas owned firms in manufacturing and services separately. Whilst UK owned R&D was more important than overseas owned R&D in services, the reverse was true in the case of manufacturing.

To the extent that decisions affecting overseas sources of finance are relatively free of the institutional factors affecting the UK financial markets and to the extent that the parents of foreign owned subsidiaries are also relatively free of those pressures then the influence of UK's variety of capitalism might be attenuated. To track the effect of internationalisation, however, requires a finer grained analysis than can be attempted within this report, since effects may vary from sector to sector and parent company to parent company. Where US funding and ownership predominates then liberal market capitalism and management practices may be reinforced and vice versa for German, Japanese or Korean involvement (see for example Child et al., 2001). In general comparisons of UK with US owned businesses in the UK suggest superior innovation performance and management practices of the latter based primarily on "tougher" labour market practices (Giffith and McCarney, 2012), Bloom et al, 2007, Bloom et al., 2012). Equally there is evidence for the US that the presence of institutional

investors in the share ownership of larger corporations enhances innovation as measured by patent performance Equally there is evidence for the US that the presence of institutional investors in the share ownership of larger corporations enhances innovation as measures to patent performance (Aghion et al, 2013).

Exhibit 27 Foreign and Domestic Ownership of Services and Manufacturing UK R&D 2011



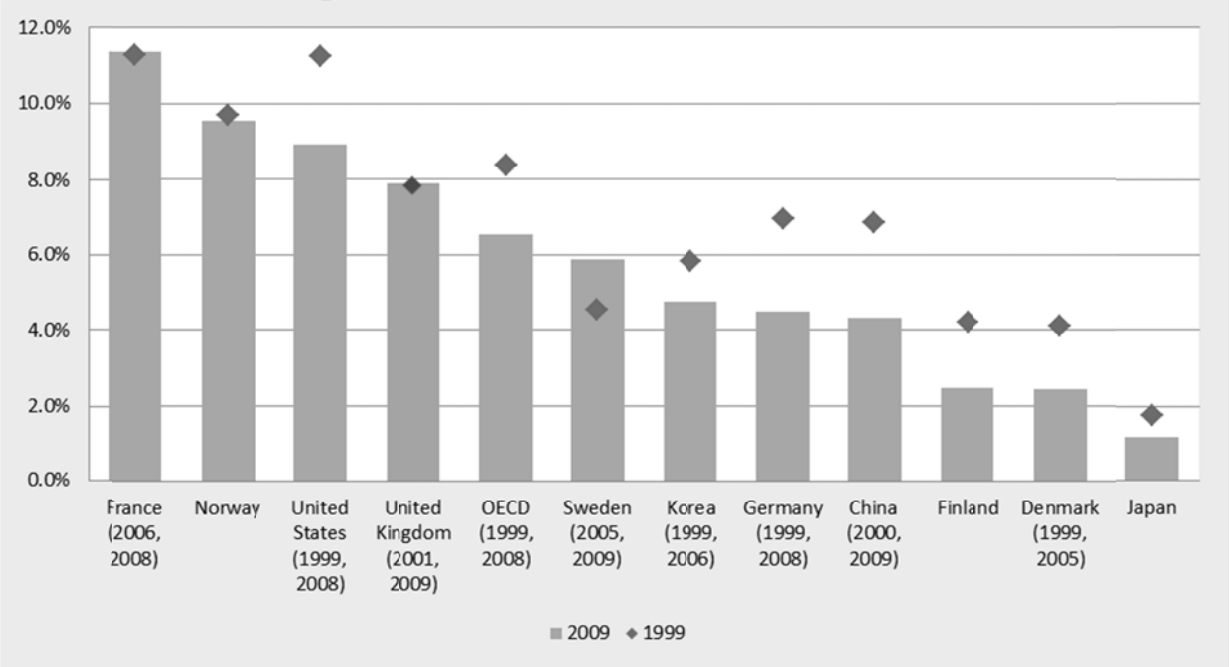
Source: ONS

The extent to which UK BERD is carried out by overseas businesses and is funded from overseas is therefore a significant and distinctive feature of the UK manufacturing system.[10]

4.3.5 Public Sector Funding of R&D

Government funding for manufacturing R&D also varies substantially across countries. Thus, Exhibit 28 shows that the percentage of manufacturing BERD which is financed by government is around 14% in France around 11% in the United States, and around 9% in the United Kingdom and 4.5% in Germany[11]. It is striking that the percentage is so high in the United States given the liberal free market credentials typically attributed to that country. The role of the public sector as a direct source of, and support for, venture capital in the US has been typically underplayed in interpretations of that country's innovation performance. Major departments of state in particular through programmes such as the Small Business Innovation Research Programme (SBIR) have played a key role in the direct development of early stage technologies and helped to de-risk investments by later stage private sector venture capitalists (see, for example, Lerner, 1998; Connell, 2006, Hughes, 2008).

Exhibit 28 Government-financed R&D in business, 1999 and 2009 (as a % of R&D performed in the business sector)

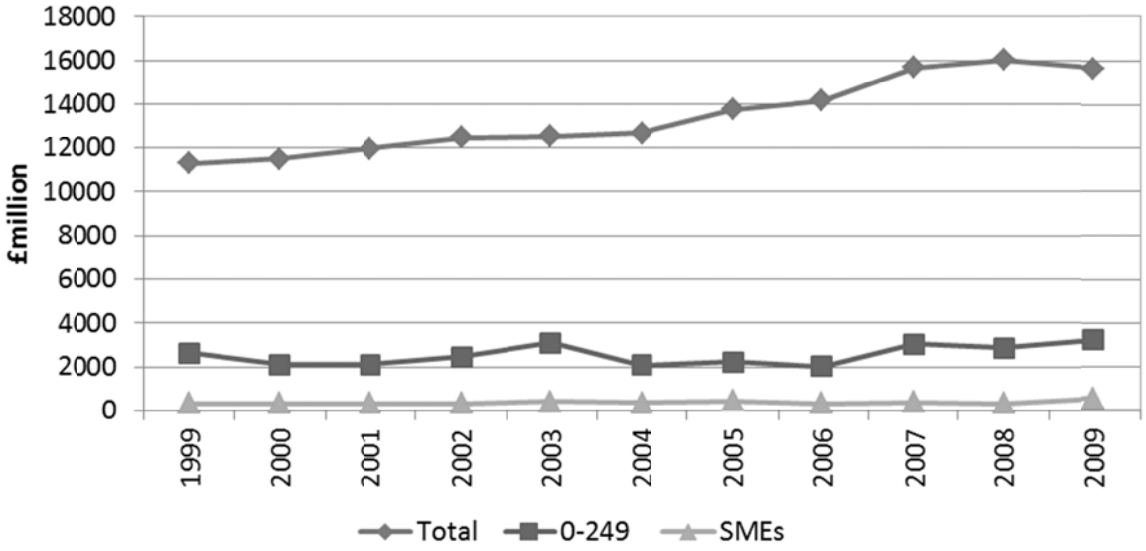


Source: Authors calculations based on OECD STI database

4.3.6 The Distribution of R&D Expenditure and Public Sector Support for R&D by Size of Firm

So far this report has focused on the aggregate picture within the broad categories of BERD. It is, however, possible to examine the extent to which business expenditure on R&D is carried out by firms of different sizes. Exhibit 29 shows that in the UK BERD is dominated by larger businesses and their subsidiaries. It is thus apparent that independent small and medium-sized enterprises employing fewer than 250 employees are negligible in terms of the overall UK R&D effort. They accounted for less than 4% of total R&D. If we define small and medium-sized enterprises to include the subsidiaries of larger firms, then they account for a somewhat greater percentage, but the vast bulk of R&D in the UK is accounted for by the largest businesses.

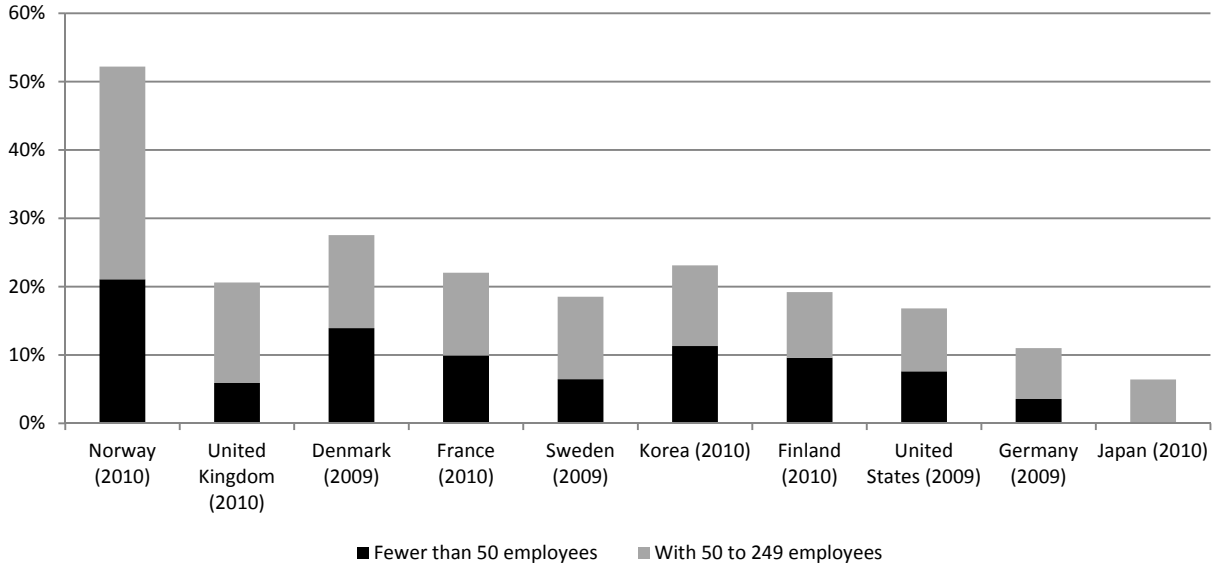
Exhibit 29 BERD in UK is dominated by larger businesses and their subsidiaries



Source: Authors calculations based on ONS data

It is not possible to do an international comparison of R&D by size class of *independent* small firms. It is, however, possible to do a comparison based on small and medium-sized enterprises employing fewer than 250 employees where subsidiaries of larger companies are included in the definition. Exhibit 30 shows that the US, Germany and Japan are all at the lower end of the spectrum in terms of the role of small firms compared with Norway, Denmark and Korea which are grouped at the other end with the UK in the middle.[12]

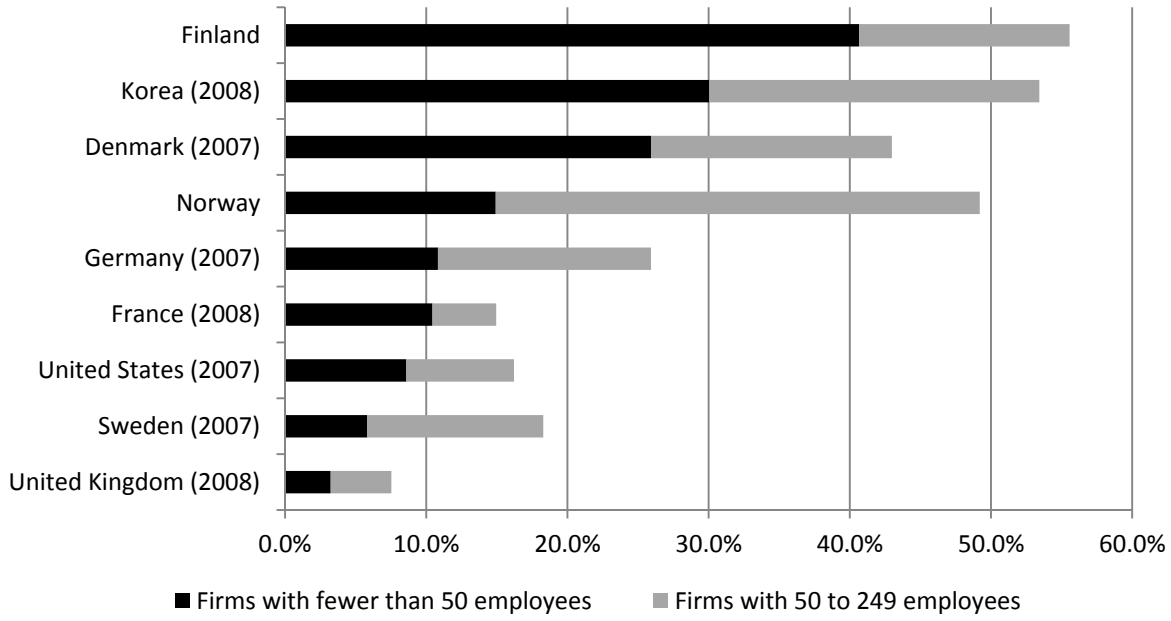
Exhibit 30 Business R&D by size class of firms, latest year (as a % of total BERD)



Source: Authors calculations based on OECD STI database

The distribution of the R&D effort by size of firm means that there is a similar concentration of government financial support for R&D. Even given the overall distribution of R&D activity by size of firm, it is striking in Exhibit 31 that the UK has the smallest proportion of government financial support for R&D going to small and medium-sized businesses.

Exhibit 31 Government Financial Support for R&D by Size Class of Firm (%)

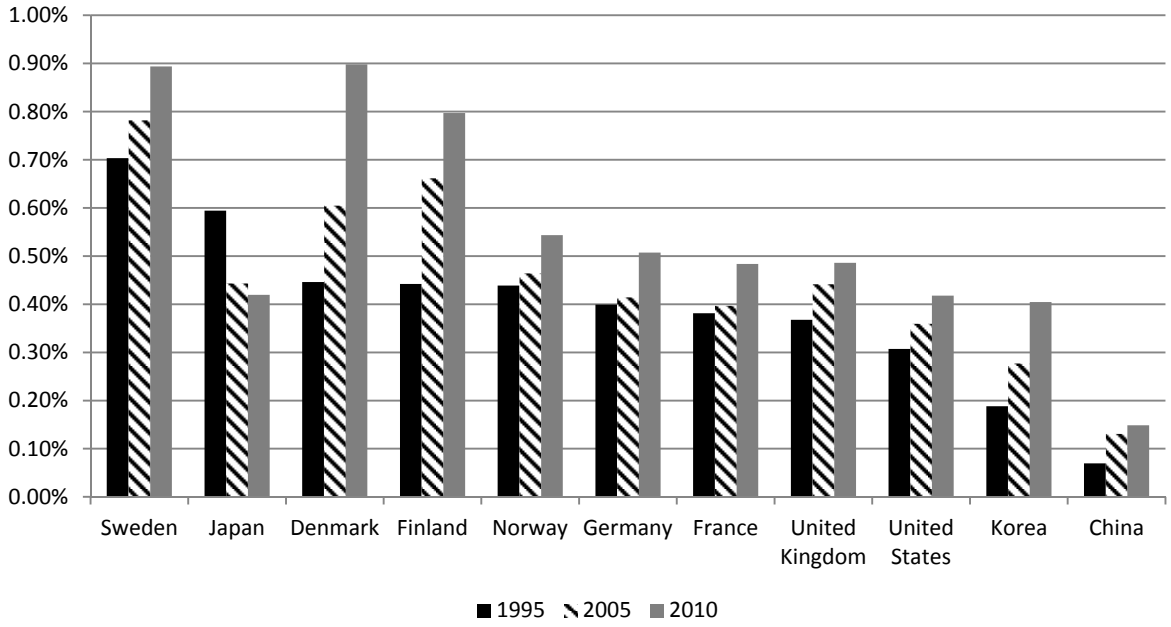


Source: Authors calculations based on OECD STI database

4.3.7 Higher Education R&D (HERD)

So far the discussion has focused on business and manufacturing R&D. An important component of the R&D effort of a country, however, is the R&D which is carried out in the Higher Education sector. This is not readily classifiable into the contribution it makes to manufacturing or other sectors, but is important to examine in its own right, since it contributes to the manufacturing innovation effort. Exhibit 32 shows the proportion of higher expenditure on Higher Education R&D as a percentage of GDP between 1995 and 2010. In the UK and elsewhere there has been an increased tendency for Higher Education R&D to rise as a percentage of GDP with Japan being the sole exception to this trend. The UK ranks towards the lower end of the spectrum in terms of Higher Education R&D as a percentage of GDP.

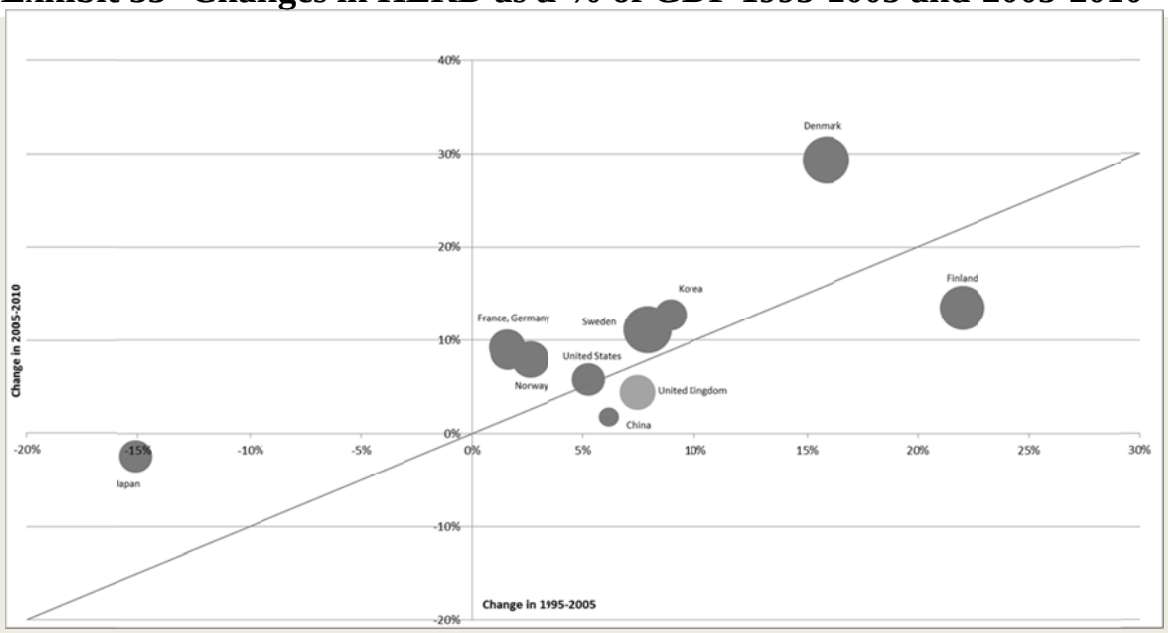
Exhibit 32 HERD as a % of GDP 1995, 2005 and 2010



Source: Authors calculations based on OECD STI database

Moreover, as Exhibit 33 shows the UK has lagged behind other economies in the extent of changes in expenditure on Higher Education. The exhibit compares the change in HERD as a percentage of GDP in 2005-10 compared with a similar change in 1995-2005. The UK lies below the 45 degree line which would imply the same rate of growth between the two periods. It shares this position with Finland and with China. All of the other economies had a faster rate of growth of HERD as a percentage of GDP in the later than in the earlier period. The UK's position has thus relatively worsened.

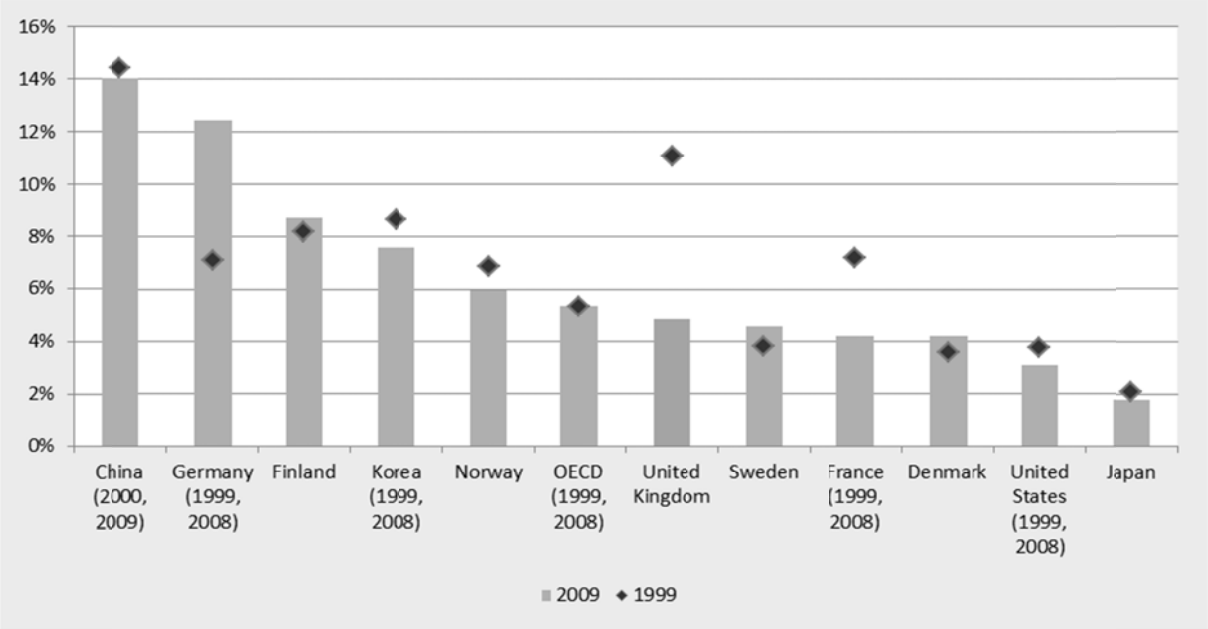
Exhibit 33 Changes in HERD as a % of GDP 1995-2005 and 2005-2010



Source: Authors calculations based on OECD STI database

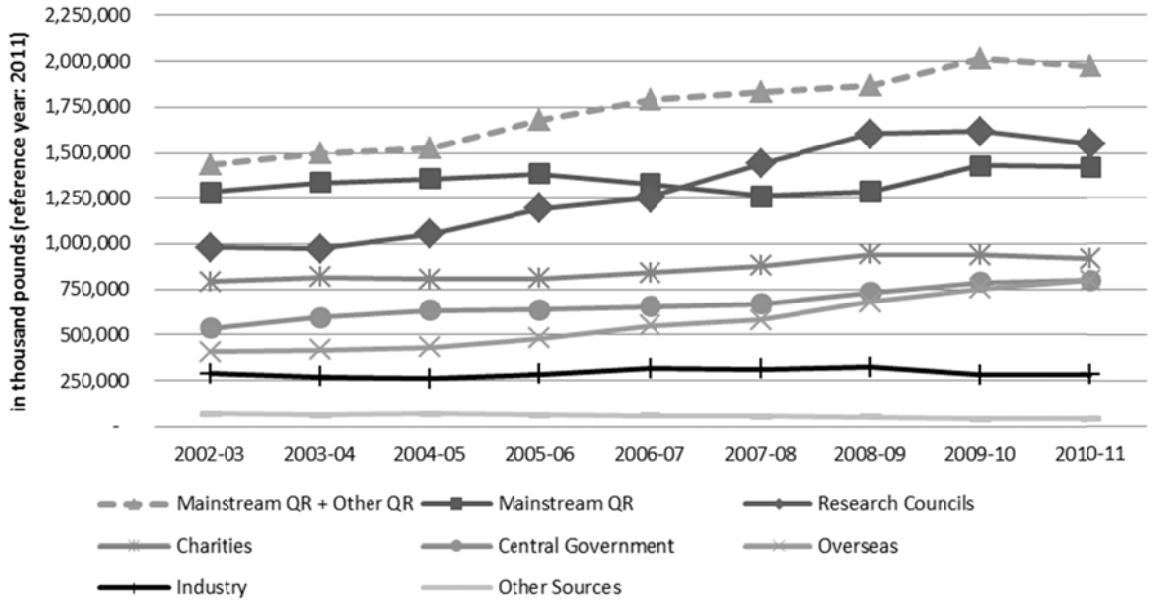
It is also possible to look at the extent to which business funds Higher Education R&D. Here Exhibit 34 shows a notable deterioration in this aspect of the funding of R&D in the UK. Whereas several countries show some weakening of business funding of Higher Education R&D, the fall over the period shown was an order of magnitude greater in the case of the UK. These results may be sensitive to the end years analysed and the extent to which the UK data reflects a longer period over which the impact of the financial crisis and austerity policies may have had an effect, Nonetheless, the weakening of the Higher Education R&D effort as well as the weakening of the connection between business R&D and the university R&D effort may suggest a weakening of the connection between the science base and industrial sectors, including manufacturing sector.

Exhibit 34 Business-funded for R&D in the higher education and government sectors, 1999 and 2009 (as a % of R&D performed in these sectors (combined))



Source: Authors calculations based on OECD STI database

Exhibit 35 The Funding of UK University Research: Dual Support and Other Sources 2002-3 to 2010-11 (in 2011 Prices)



Source: Hughes et al 2013

The relative importance of business funding for university R&D alongside other sources summarised in Exhibit 35. The exhibit shows all forms of funding for university research in the UK. The most important sources are quality related funding (QR) and funding from the research councils. The latter has a strong

upward trend in the middle of the period shown which reflects in large part an increase in the proper funding for university R&D brought about by the introduction of full economic costs. A condition of this was in principal that it would *not* be associated with increasing the volume of research funded. The impact of recent ring fencing in money terms, but decline in real terms is also shown in the exhibit. The diagram confirms the weak position of industry as a funding source, but also shows that as with the funding of business R&D itself, there has been an upward trend in the extent to which the University/Higher Education sector has been able to attract funding from overseas.

Summary Findings on Investment and R&D

Taken together this analysis of R&D suggests that as with overall investment the UK has occupied a relatively weak and worsened position in terms of the overall R&D effort. This is a characteristic of the manufacturing as well as of the overall business R&D spend. The UK's R&D effort, especially in manufacturing, is massively reliant on overseas funding and also is carried out disproportionately by the subsidiaries of overseas organisations. The vast bulk of R&D is carried out by a relatively small number of large firms. To extent that manufacturing may be expected to have benefitted from R&D expenditure in the Higher Education sector, it is a matter of concern that the UK's relative pattern of expenditure on Higher Education R&D has also been relatively worsening, whilst the connection between businesses and university R&D through the provision of funding has fallen. The UK (and the US) show relatively high degrees of public sector funding of manufacturing R&D by the public sector and it is noticeable that the extent to which government funds R&D in manufacturing is much higher in those two countries and France than in, for example, Germany Japan and Finland. This aspect of the UK variety of capitalism implies considerable and potentially strategic state support in these liberal market economies.

As with business R&D, so with Higher Education R&D, there is evidence of the relative attractiveness of the UK as a target for overseas funding.

Taken together the analysis of trends in fixed investment and in R&D suggests that the UK has performed relatively weakly by international standards and that its performance as measured in terms of R&D intensity has fallen over time. The extent to which this relative performance and pattern over time is attributable to the particular nature of UK financial markets is analysed in the remaining sections of this report. The focus on R&D and innovation is consistent with an emphasis on the role of public capital markets, since it is large firms in particular that dominate the R&D spending pattern and it is public capital markets which

provide High Initial Public Offerings (IPOs), the exit route for early stage venture capital and other investors in small non-quoted businesses.

5. UK Capital Markets and Finance for Investment and R&D

5.1 Sources of External Finance: Debt, Equity and Retentions

Companies may fund their activities by internal retention of cash flows or by raising funds externally from either debt or equity sources. It is useful to summarise briefly the forms and sources of external finance (i.e. in addition to retained profits) available to UK businesses as a backdrop to analysing the evidence.

Equity finance involves the issue of shares to new or existing shareholders. Debt may take the form of loans from banks and other financial intermediaries or bonds issued on the bond market.

Bonds and shares can be issued to and traded by investors in general on public capital markets. It is also possible to make private placements with smaller groups or individual investors.

It is important to note that the use of public markets to raise external finance is restricted in practice to a small number of companies. Thus of an estimated 1.2 million public non-financial companies only 1,257 or 0.1% issue public external finance. These 1,257 companies, however, employ 3.7 million people or 16% of UK private sector employment and account for around 47% of UK domestic investment (Pattani and Vera (2011) p.322).

Exhibit 36 shows that in the UK around 50% of the outstanding value of debt and equity takes the form of bank loans, around 25% takes the form of public corporate bonds and around 25% is accounted for by equity.

Exhibit 36 UK Public Non-Financial Corporations public debt and equity (a)(b)

	Amount outstanding (£billions)
Memo: bank loans	**722**
Public corporate bonds	**338**
of which	
Secured	*5*
Unsecured	*333*
and of which:	
Stand alone bonds	*316*
Programme bonds (medium-term notes)	*22*
Public equity	346
Of which:	
Common equity	345
Preferred equity	1

Sources: Dealogic, ONS, Thomas Reuters and bank calculations

(a) Total corporate bonds and bank loans are from the ONS *Financial Statistics* for 2010. The amount of secured bonds was estimated by scaling the total by the share of bonds of the same type reported by Dealogic for the period 1980-2011 – and similarly for unsecured, stand alone bonds and medium-term notes*. Total public equity is estimated as a total face of value of common stock and preferred stock, including capital surplus, as reported by UK PNFCs covered by the Thomason Reuters Worldscope database in fiscal year 2010.

(b) Includes foreign currency issuance.

* Medium-term notes are another type of public debt, less common in the UK. Unlike bonds, they are offered on a recurring basis by the company, often with a menu of maturities and rates from which investors can choose.

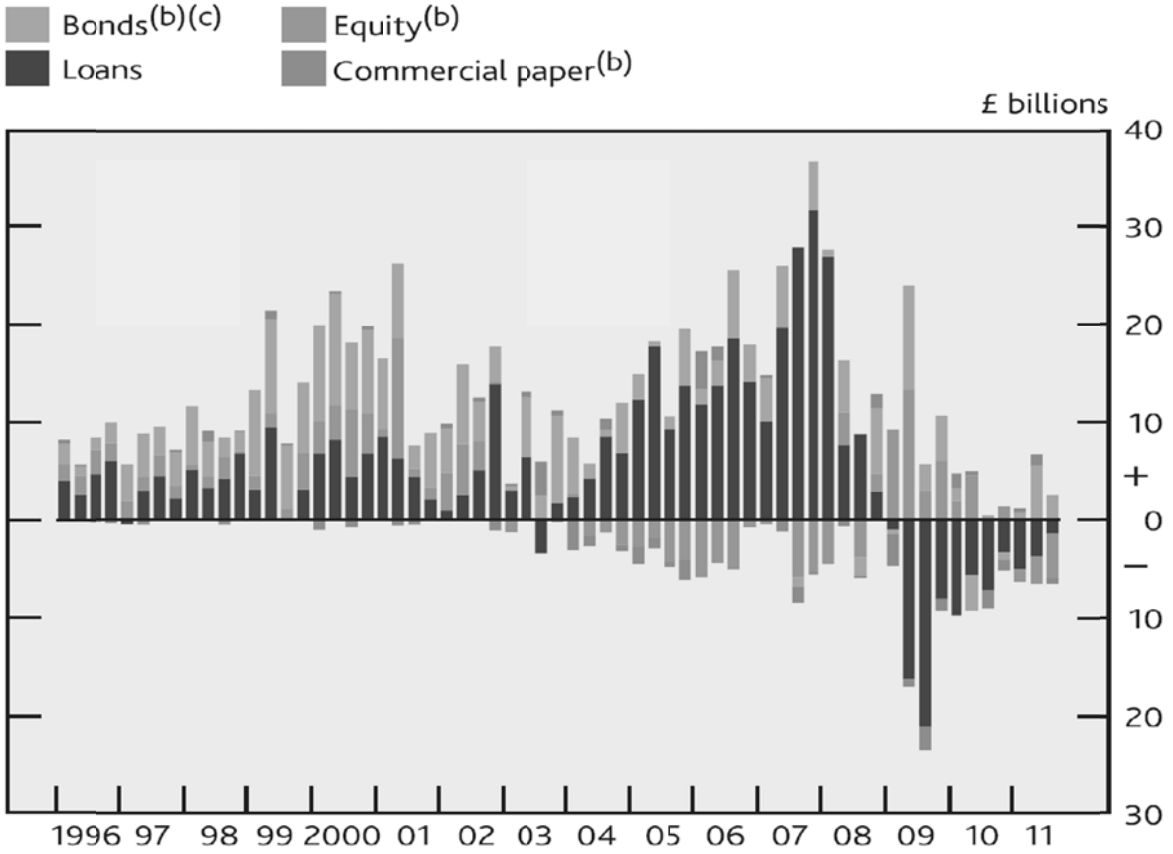
Source: Pattani and Vera (2011)

Although equity accounts for around a quarter of the balance sheet value of external financial assets, it occupies its place principally because of the equity issued at the time of public floatation, or from the issue of new equity in relation to takeovers. It plays a very small role in the subsequent financing of investment for expansion.

Historically a very high proportion of investment in the UK has been funded from retained earnings and, where external finance is raised, loans and bonds have historically been more important than equity. For example, Exhibit 37 shows that net external finance rose between 1996 and 2011. It is apparent that equity is relatively insignificant, especially compared to loans. The exhibit also shows significant variations in the extent to which bond finance has been used over time: It also shows a major increase in loans in the period 2004-2008 and a

subsequent massive de-leveraging following the financial crash. Since the turn of the current century the exhibit shows that there has been a preponderance of years in which companies have reduced the amount of equity outstanding through share buy-backs.

Exhibit 37 UK PNFC net external finance raised (a)

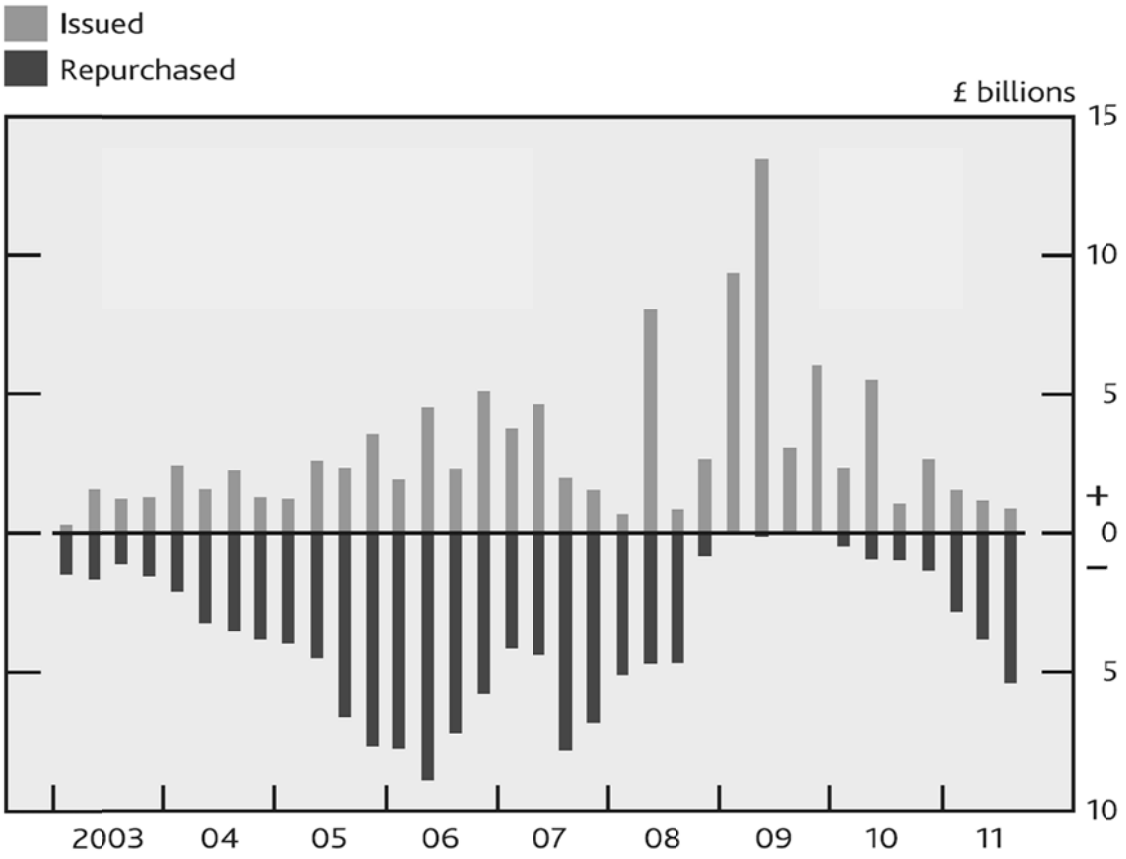


(a) Includes sterling and foreign currency issuance.
(b) Non seasonally adjusted.
(c) Includes stand alone and programme bonds.

Source: Pattani and Vera (2011)

Exhibit 38 shows the pattern of equity issue and repurchase since 2003. The net equity issues in 2009 represent the replacement of bank loan finance which was scarcer after the financial crisis.

Exhibit 38 Equity issuance and repurchases by UK private non-financial companies (a)

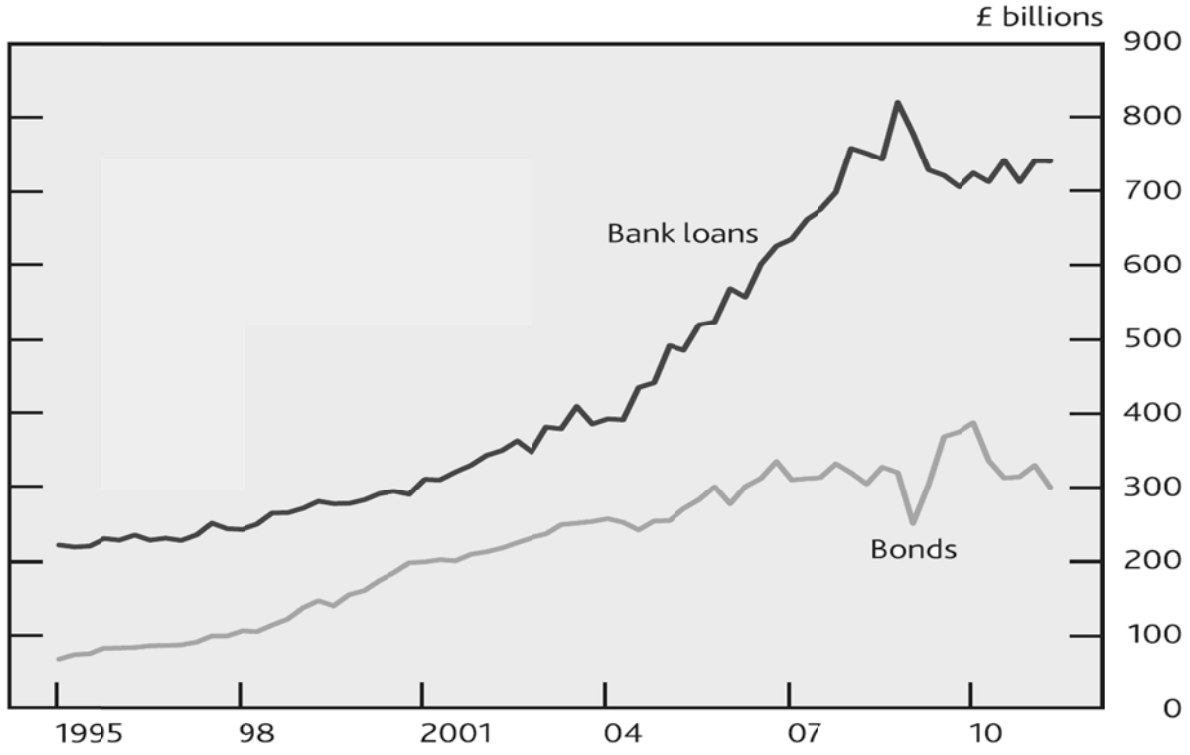


(a) Quarterly gross repayments and issues of all currency shares in sterling, non seasonally adjusted.

Source: Pattani and Vera (2011)

The growing importance in the medium-term of the stock of bank loans and corporate bonds is shown in Exhibit 39. The sharp contraction in bank lending after the crisis was associated with an increase in the issues of corporate bonds in an attempt to replace bank loans.

Exhibit 39 UK PNFC stock of bank loans and corporate bonds

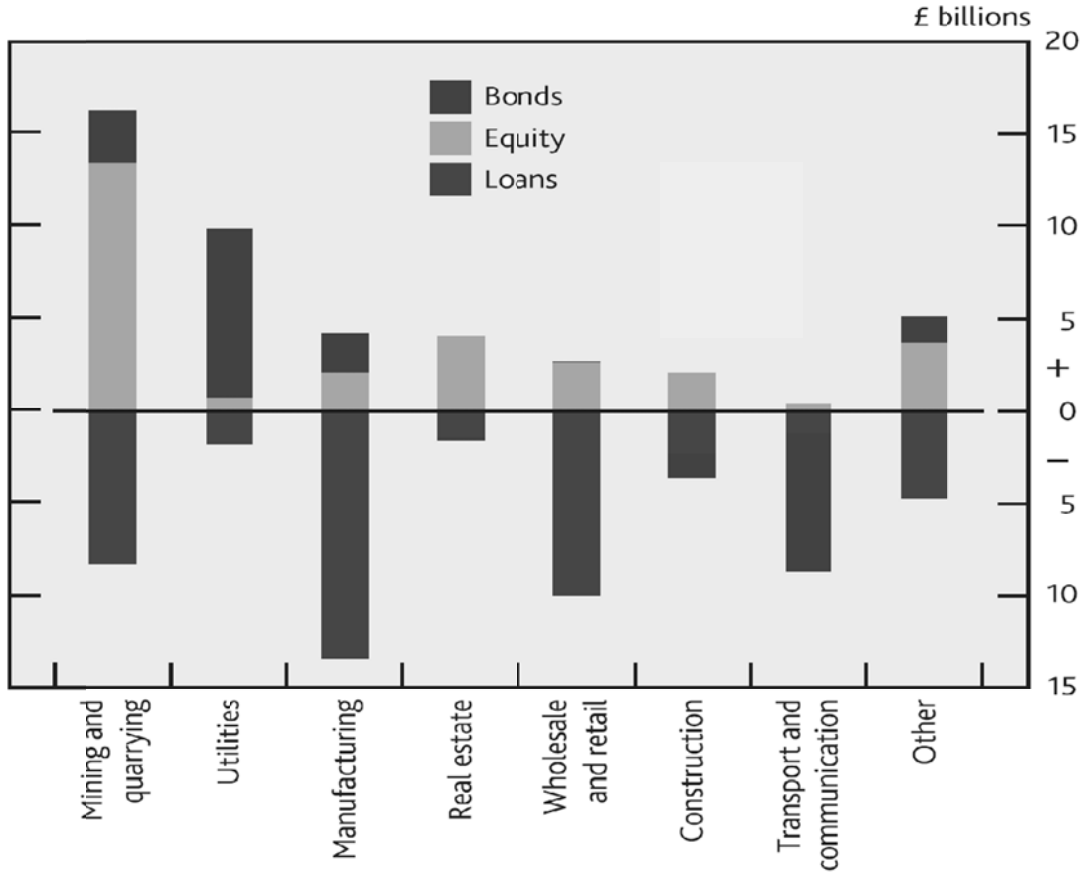


Source: Thomson Reuters Datastream.

Source: Pattani and Vera (2011)

Exhibit 40 shows the sectoral breakdown of net funds raised by UK businesses in 2009 and shows the massive reduction in loans experienced in manufacturing and the relatively small net increase in funds for that sector from bonds and equity. Manufacturing has thus been relatively hard hit compared to the rest of the economy.

Exhibit 40 Analysis of net funds raised by UK businesses in 2009 by industrial sector (a)



(a) Funds raised by PNFCs from UK monetary financial institutions and capital markets. Data cover lending in both sterling and foreign currency, expressed in sterling terms. Loans are seasonally adjusted. Bond and equity issuance are non seasonally adjusted. Commercial paper is included within bonds.

Source: Pattani and Vera (2011)

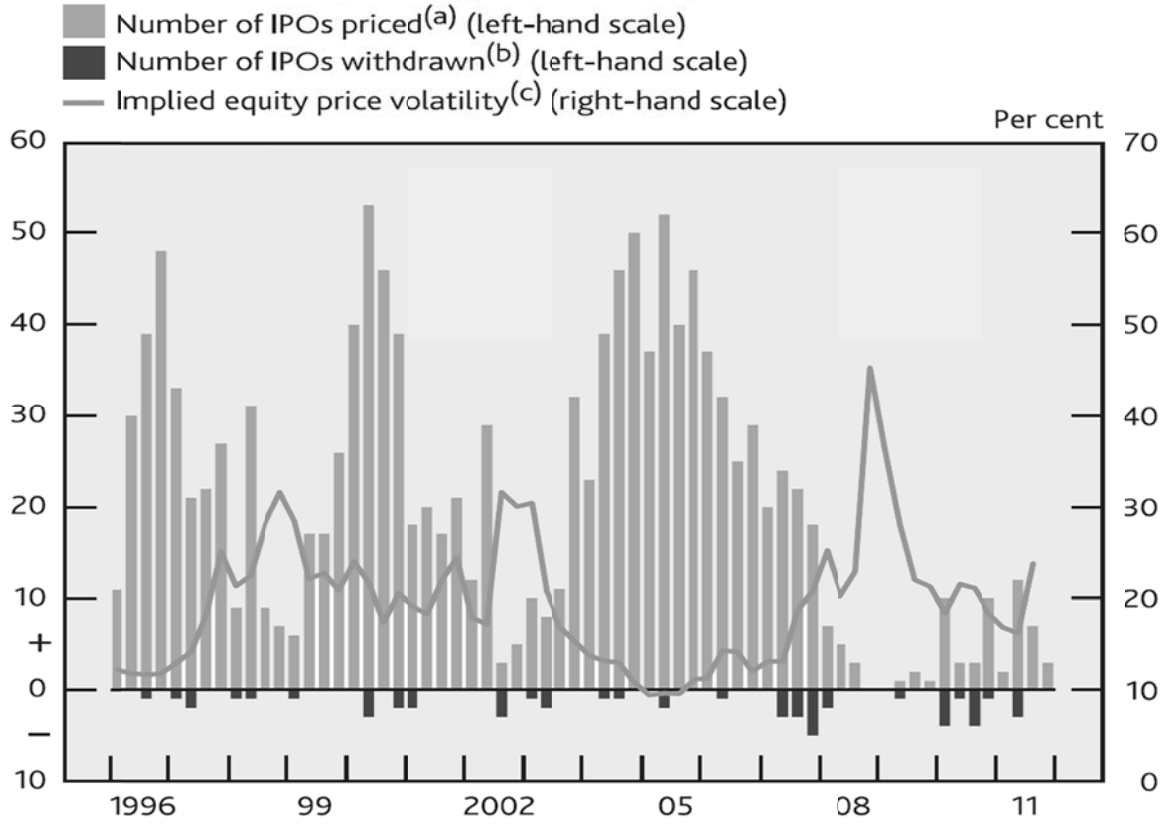
5.2 Equity Markets and Initial Public Offerings

Although the issue of equity on the stock market has historically been a relatively small source of funds for new investment by private non-financial corporations, the existence of the stock market represents an important means whereby the founders of and investors in new businesses may exit and extract the value of their investment by floating on the stock exchange. A healthy rate of establishment and financing of new ventures may therefore depend on a healthy market for equities.

Exhibit 41 plots the number of initial public offerings (IPOs) over the period 1996-2011. The cyclical volatility of IPOs and their dramatic reduction after the

financial crash is at once apparent. It remains to be seen how this aspect of the market recovers.

Exhibit 41 Quarterly initial public offerings by UK PNFCs



Sources: Dealogic and Bank calculations.

(a) IPOs which were announced and subsequently priced.
(b) IPOs which were announced and subsequently withdrawn from the market.
(c) Quarterly average of three-month at-the-money option implied volatility for the FTSE 100.

Source: Pattani and Vera (2011)

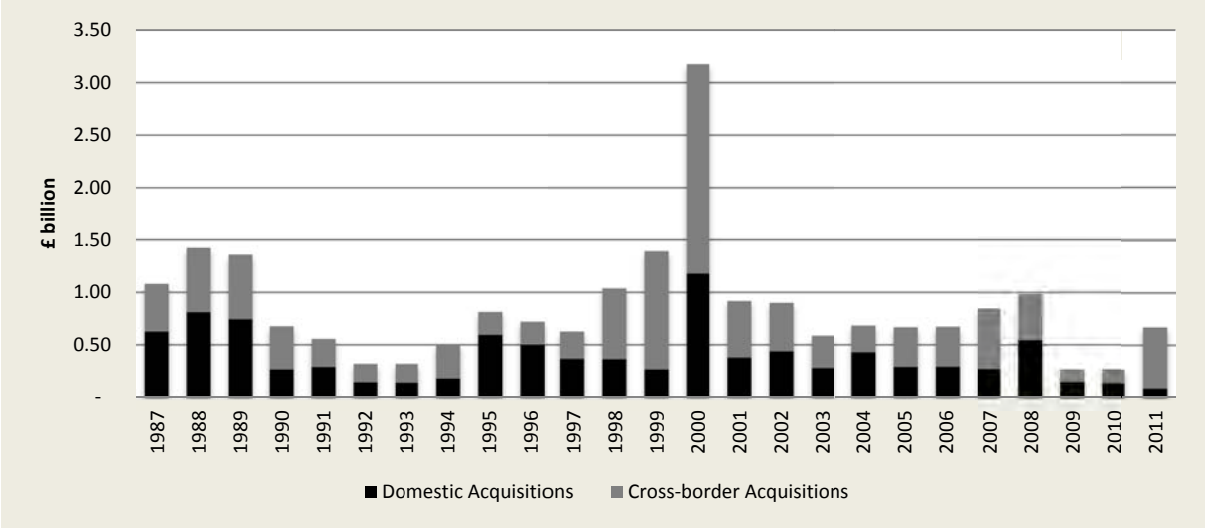
5.3 Equity Markets and Takeovers

Although the stock market may not be the source of significant new issues of equity to fund business expansion, the stock market may nonetheless play a significant role in resource allocation by influencing the allocation of corporate control between competing management teams.

The UK has, by international standards, one of the highest levels of merger and acquisition activity (Conn et al., 2005) so that the way in which the market for corporate control operates is of considerable significance.

Exhibit 42 shows long run trends in the value of domestic and overseas acquisitions by UK firms. Both series exhibit major waves and a rising proportion for overseas acquisition since the late 1990s.

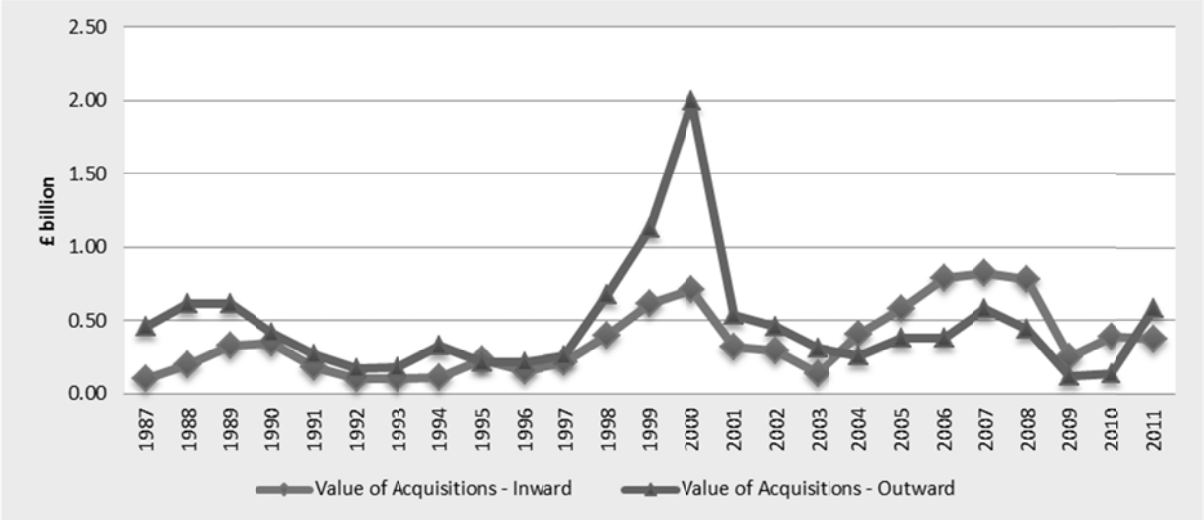
Exhibit 42 Value of Domestic and Cross-border Acquisitions



The values used are expressed in 2007 sterling values (billions), deflated using the FTSE All-Shares Index.
Source: ONS M&A Database

Exhibit 43 compares the outward M&A flow with the inward flow of acquisitions of UK companies by business based overseas. Between 1987 and 2003 the value of acquisitions abroad by UK companies was greater than the value of inward acquisitions. After 2005, however, the position has been reversed so the UK as an inward focus of merger and acquisition activity has outstripped investment in the opposite direction. The result is that a substantially higher proportion of the control of UK assets in the UK system has been transferred abroad.

Exhibit 43 Value of Acquisitions



The values are expressed in 2007 sterling values (billions), deflated using the FTSE All-Shares Index.
Source: ONS FDI Database

The argument for believing that this level of takeover activity may have a positive effect is relatively straightforward in principle. Management teams which do not maximise the best interests of their stock holders will experience a decline in relative equity prices compared with companies whose equity holders are more content with their managers' performance. Companies with relatively high share prices will be able to use their highly priced equity to buy the equity of firms with low prices and take control of their assets. Thus managers who are not acting in their shareholders' interests will be removed from control and overall corporate performance, including innovation performance, will improve.

There are a number of implications which follow from this view of the market for corporate control. The first is that one should expect to see acquired companies on the stock market being poor performers in terms of innovation efficiency or profitability. They should also be relatively low in value compared to those who are not acquired (although it is important to note that this may not be the same as being under-performers in efficiency terms). Equally acquiring firms should be relatively high-performing high-valued businesses. Finally, to the extent that the reallocation of assets between competing managements in the market for corporate control leads to assets being operated more in their shareholders' interests, we would expect to find improvements in corporate performance and market value in the aftermath of takeover.

There are a number of difficulties with these arguments. The first is that they assume there is a clear relationship between the pricing of a company's shares and the underlying performance of the assets under the management of its top executive team. Secondly, it is assumed that stock prices and movements in stock prices can be interpreted as reflecting the underlying efficiency with which managers use, for example, the assets under their control. Stock prices may diverge from underlying performance characteristics, because of excessive short-term volatility. Decisions that are perceived as in the interests of the shareholders, may not be consistent with underlying longer term gains in the interests of other stakeholders in the firms. Divergences of interest may then occur between those who hold the equity and other actors involved directly in the company in a variety of stakeholder roles, such as employees, bond holders, customers and supplies, or the communities in which the firms are based. This latter divergence lies at the heart of recent debates about the need to move away from shareholder value focused imperatives in judging company performance towards more stakeholder or stewardship contexts (Mayer, 2013).

In the case of the UK (and also of the US) there is abundant evidence that even in its own terms of share price performance the market for corporate control is extremely inefficient. There are large overlaps in the performance and share price characteristics of acquired and acquiring firms. Acquiring firms' shareholders typically lose value as a result of takeover and there is no evidence for systematic performance gain after takeover. [13] There are, in any event, substantial divergences between performance measured in terms of share price movements, in particular over the short-term, and movements in underlying measures of corporate performance, such as sales growth, profitability, innovation and/or productivity. It is more plausible to argue that the excessive pre-occupation with takeovers rather than organic investment makes the market for corporate control a hindrance rather than a help to improving UK economic performance (Kay, 2012).

The evidence on equity finance and takeovers in the UK is consistent with the financial markets acting as a constraint on innovative activity and long run time horizons in corporate decision taking.

6. Stock Markets, Banks and Venture Capital: The UK and other Countries[14]

6.1 Internal Sources of Finance

In an influential series of studies comparing international financing patterns in the 1970s and 80s it was argued that in terms of sources of finance firms overwhelmingly rely on internal finance (see, for example, Mayer, 1988; Edwards and Fischer, 1994). Thus, estimates for the period 1970-89 suggest that internal finance accounted for 40% of gross sources of funding for new fixed investment in Japan, 62.4% in Germany, 60.4% in the UK and 62.7% in the US. This suggests that, with the exception of Japan, there is significant congruence between financial systems in the importance of internal finance. As a result what becomes of central importance is the effects of governance arrangements and the market of corporate control on decision making in relation to retentions and long-term investments.

6.2 Financial Market Structures, Intermediation and Share Ownership

Bearing the significance of internal finance in mind, we can now turn to a comparison of the principal external financial structural features of the UK

compared to selected financial systems elsewhere. Thus, Exhibit 44 compares the nature of the external funding in the financial system of the UK with the sample of countries whose R&D performance was analysed above. A number of differences emerge in terms of the relative importance of stock markets, banks leverage and venture capital.[15] Differences between the UK and the US on the one hand and Germany and Japan on the other are apparent. Thus, the two "Anglo-Saxon" economies have substantially higher stock market capitalisations and stock market turnover relative to GDP compared to Japan and to Germany in particular. Germany and Japan are also much less reliant on private bond market activity than the US. In this case, however, the UK differs significantly from the United States. It has one of the lowest ratios of bond market capitalisation to GDP of the sample of countries as a whole. Levels of leverage in the UK and the US are relatively low, especially compared to Japan and the Nordic countries. There is not, however, a particularly important difference between these two countries and Germany.

Finally the exhibit shows venture capital as a percentage of GDP. It is of course well known that the largest market for venture capital in absolute terms is to be found in the USA followed some distance behind by the UK. It is also well known that this form of finance is exceptionally sensitive to the state of the stock market. The final two columns therefore show VC funding as a percentage of GDP pre and post the global financial crisis. Prior to the crash the US was indeed the most VC intensive country consistent with its stock market orientation. However, it lost that position after the crash. The Nordic economies were strikingly able to maintain their VC intensity as did the UK (though this reflects a collapse in both the numerator and the denominator). Japan and Germany as predicted by the complementarity thesis have low VC intensity to match their bank-dominated financial systems.

Overall, these broad indicators suggest that there are significant, but complex variations across countries which do not always correspond to simple two way ideal type divisions. This suggests that analyses of the financing of innovation in the UK as elsewhere need to be rooted in detailed contextual approaches of a country's overall innovation and economic system.

Exhibit 44 Financing R&D: Stock Markets, Bond Markets, Stock Markets, Leverage and Venture Capital

Country	Stock Market Capitalisation / GDP		Stock Market Total Value Traded / GDP		Private bond market capitalisation / GDP		Listed Companies Median Leverage Ratios		Venture Capital % GDP			
	Average (2001-2010)	Rank	Average (2001-2010)	Rank	Average (2001-2010)	Rank	Average (1991-2006)	Rank	Average (2000-2003)	Rank	2008	Rank
Finland	106.5	3	129.5	4	23.8	9	0.3	4	0.20	5	0.23	2
Korea	68.4	7	143.2	3	57.7	3	0.5	1	0.27	2	0.07	8
Sweden	102.4	4	125.5	5	45.5	4	0.2	7	0.24	3	0.21	3
Japan	77.8	6	88.8	6	41.8	6	0.3	3	0.03	10	0.01	10
Denmark	62.3	8	50.3	10	140.9	1	NA	NA	0.13	6	0.30	1
Germany	46.4	10	65.5	8	39.6	7	0.2	7	0.10	9	0.05	9
US	124.4	2	259.3	1	107.5	2	0.2	9	0.38	1	0.12	6
France	81.2	5	81.8	7	44.0	5	0.3	5	0.11	8	0.09	7
UK	127.5	1	175.7	2	16.0	10	0.2	8	0.22	4	0.21	3
Norway	52.9	9	60.1	9	25.2	8	0.4	2	0.12	7	0.13	5

Source: Authors calculations based on Demirgüç-Kunt et al., World Financial Structure Database (Cols 1-3), Fan et al., 2010 (Col 4) and OECD Science and Technology Indicators (Col 5).

In their analysis of external finance in the 1970s and '80s Mayer (1988), Edwards and Fisher (1994) and Corbett and Jenkinson (1994) showed that bank finance was more important source of the flow of funds in Japan than in the UK and the US. Germany was, however, if anything, less reliant on bank finance than the UK and the US. It accounted for 18% of all gross sources of finance in that country compared to 23% in the UK, 34.5% in Japan and 14.7% in the US (see, for example, Corbett and Jenkinson, 1994, Table 2, p.9). This position was even more striking when net sources of finance were calculated by subtracting companies' acquisition of financial assets from equivalent increases of liabilities.

More recently using recent harmonised national accounts data Byrne and Davis (2002), however, show that significant differences in financial market structures and in the intermediary role of banks exist between the UK and Germany. These differences are broadly consistent with the former falling into the coordinated insider system and the UK into the more dispersed shareholder liberal market economy system. Thus, in terms of household sector ownership of financial assets (adjusted for patterns of institutional holdings in the two countries), the UK household sector held 52% of its assets in the form of equities compared to only 27% in the case of Germany. Bank deposits accounted for 45% of such holdings in Germany and only 25% of assets of the household sector in the UK. Similarly, in the case of Germany loans amounted to 42.8% of the company sectors' liabilities in 2000 compared to 22.5% in the case of the UK. Even though this marked a substantial decline in the use of loan finance in Germany from just below 70% in 1980 and 1990, it still remained substantially higher than in the UK. By contrast 70% of the UK company sectors' liabilities took the form of equity compared to only 55% in Germany in 2000. Whilst this difference is relatively clear cut, the differences between the UK, France and Italy in terms of these patterns is much less clear with the UK much more like them than Germany (see also Deeg 2009).[16]

Exhibit 45 based on Carlin (2009) provides further evidence on the nature of share ownership for six European countries for the period 1997-2004. The breakdown focuses on banks, non-financial companies, individuals and the public sector as well as showing the split between foreign and domestic ownership.

Exhibit 45 Market Capitalisation by Type of Shareholder: Selected European Countries

Country	Year	Foreign	Domestic, of which Financial institutions	of which banks	Non-Financial company	Individual / family	Public Sector
UK	1997	24.0	56.3	0.1	3.1	16.5	0.1
	2004	32.6	51.5	2.7	1.7	14.1	0.1
Germany	1996	15.3	20.6	9.5	37.5	15.7	10.9
	2004	21.0	15.0	6.6	42.9	14.5	6.6
France	1996	24.9	27.6	8.7	29.3	12.4	2.6
	2004	39.6	31.4	9.9	16.3	6.3	6.3
Sweden	1996	31.6	30.3	1.6	10.8	19.1	8.3
	2004	33.9	28.5	3.4	10.5	17.8	9.5

Source: Adapted from Carlin (2009). FESE Share ownership data of companies listed on European stock exchanges. The main information sources are: registers of significant shareholdings and of the entities regulating the market; central banks; national statistical offices; official registries of international transactions; central registry entities.

The difference between the UK and the mainland European economies in terms of bank ownership is at once apparent. It is noticeable that bank holdings have increased from a very low level in the UK over this period. In general, the internationalisation of stock markets is reflected in an increase in foreign shareholdings, particularly in the case of UK, Germany and France. The latter has also seen an unwinding of shareholdings by non-financial companies. There have also been noticeable changes in the role of the public and of the foreign sectors.[17]

One of the most striking developments in patterns of equity investment has been the growth of sovereign wealth funds. The increasing significance of sovereign wealth funds, in particular those based on the Middle East economies and in China, have led to major changes in equity holding patterns in Europe and the USA. The largest Sovereign Wealth Funds (SWFs) in the period 1985-2009 were based in Singapore, China and UAE - Abu-Dhabi. Total SWF investments in this period focused on the USA ($58.3bn), China ($32bn) and the UK ($20.8bn). The UK was the third biggest recipient of such funds. The implications for governance and short-termism are not clear. Prior to the financial crisis of 2007-8 SWFs had a track record of passive investment, a desire to avoid political backlash and of being relatively long-term stable

shareholders. There is little systematic evidence of impact on decision making or performance of the firms in which they invest (Fotak et al., 2013). Nevertheless, in the USA the magnitude of SWF investments has led to pressure to protect the liberal market based US economy from what is interpreted as a mercantilist intrusion by state owned or strategically focused sovereign wealth fund investment activity. Such actions include, for example, the call for voting rights to be suspended for sovereign wealth fund holdings until such holdings are returned to non-state ownership (see, for example, Pistor, 2009, and Gilson and Milhaupt, 2008).

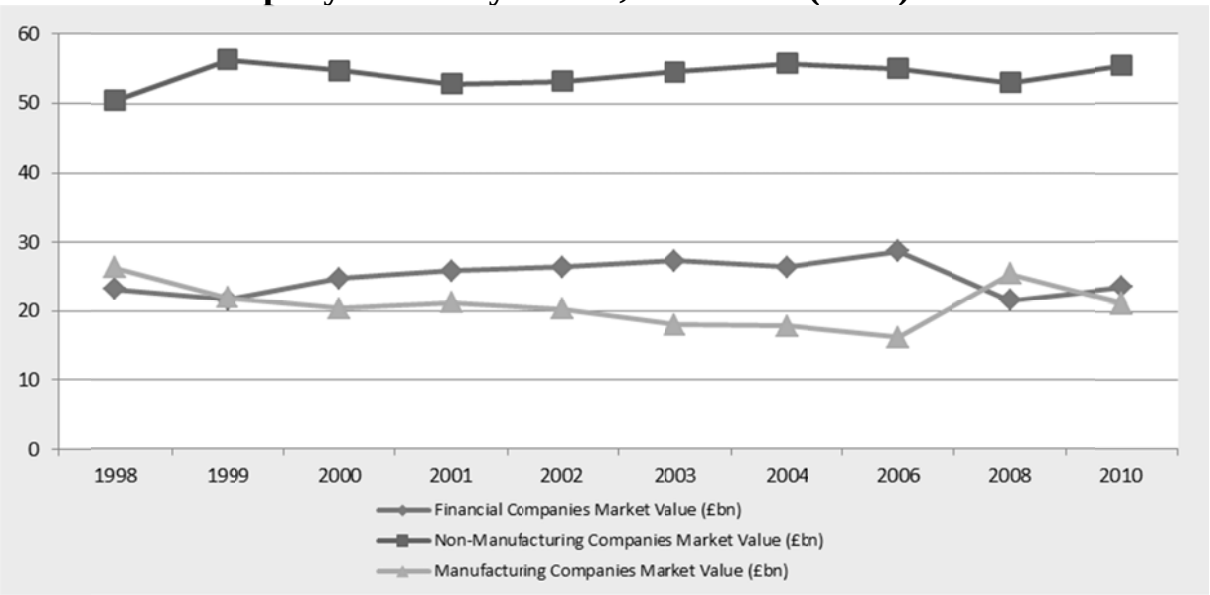
Taken together these studies suggest that the UK is characterised by relatively low levels of bank share ownership, and cross shareholdings by non-financial institutions. It has in contract high levels of share ownership by both domestic financial institutions and overseas investors. It thus appears to fit the model of an open stock market based relatively globalised financial system.

There are, however, signs of convergence towards UK in terms of the effects declining cross firm holdings and increased foreign ownership (e.g. France).

7. Share ownership in the UK and other Countries

Given the significance of the stock market and the role of shareholders in the UK, it is useful to examine trends in share ownership in manufacturing in the UK on a consistent basis since 1998 to identify the interests potentially involved in governance issues by virtue of holding equity. Exhibit 46 begins by showing the distribution by total market value of companies quoted on the UK stock exchange classified to the non-manufacturing sector, the financial sector and manufacturing. The share of manufacturing companies in total UK stock market capitalisation fell significantly from 26.3% in 1998 to 16.2% in 2006 in line with the de-industrialisation of the economy. This fall was briefly interrupted by the impact of the financial crisis which led to a relative collapse in the share prices of financial companies and a consequent rise in the shares of manufacturing and to a lesser extent non-manufacturing companies.

Exhibit 46 The Distribution of the Market Value of UK Publicly Listed Company Shares by Sector, 1998-2010 (in %)



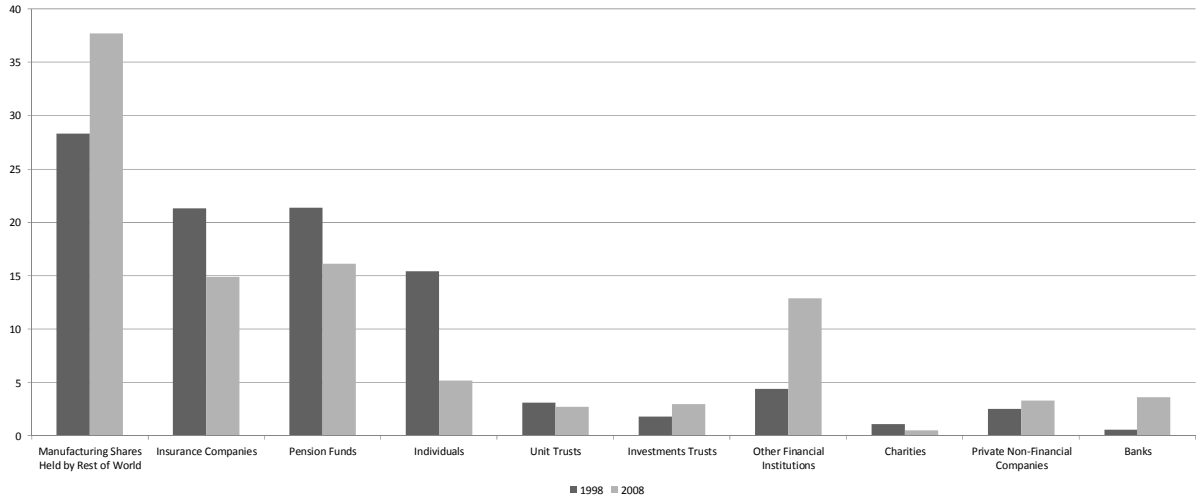
Source: Authors calculations based on ONS Share Ownership Data

Exhibit 47 shows who holds the shares in quoted manufacturing companies and the evolution of shareholding from 1998 to 2008 (the latest year for which this breakdown is published). The most striking change is in the increasing dominance of overseas shareholdings and the decline in individual holdings and in particular insurance companies and pension funds holdings. There was also a rise in 'Other Financial institutions'. These include: shares held by brokers and security dealers investing on their own account; venture capital companies; and unauthorized investment and unit trusts. Their share rose significantly in 2000 to 2001 as they purchased shares disposed of by individual pension funds and insurance companies (ONS Share Ownership Survey 2001, p.11). The growth of institutional investment in the OECD economies as a whole has nonetheless been substantial with assets held by institutional investors increasing from around US$25 billion in 1995 to around US$65 billion by 2009. A significant proportion of the overseas holdings will therefore consist of holdings by overseas financial institutions. This trend observed reflects increased holdings by overseas sovereign investment funds as well as the extensive diversification into the UK stock exchange by individuals and institutional investors in other countries. When an analysis is carried out of the largest 100 companies (irrespective of sector) which dominate UK R&D, it turns out that these are the corporations in which the rest of the world's holdings are greatest. Thus, at the 31st December 2010, 84.6% of the rest of the world's shareholders in UK quoted companies taken as a whole were within the FTSE 100. Although great interest has centred on the role of newly emerging financial powers such as India, Russia and the Asian economies, it is important to note that the breakdown of the rest of the world's holdings of UK shares shown in Exhibit 48 reveals that

Europe and North America continue to be the dominant overseas holders of UK equity. Thus the whole of the Asian economies account for only 11% of holdings compared to 56% in North America and 28% in Europe. To the extent that the US which dominates overseas holdings is a stock market based system and to the extent also has a predisposition to short-termist takeover strategies and breaches of trust between stakeholders, little might be expected in terms of socially efficient takeover outcomes (Hatsopolous et al., 1988, Dallas, 2011; Shleifer and Summers, 1988). The evidence on takeover outcomes does in fact suggest little change in the generally abject performance outcomes from merger and acquisition over time (Cosh and Hughes, 2008; Croce et al., 2011).

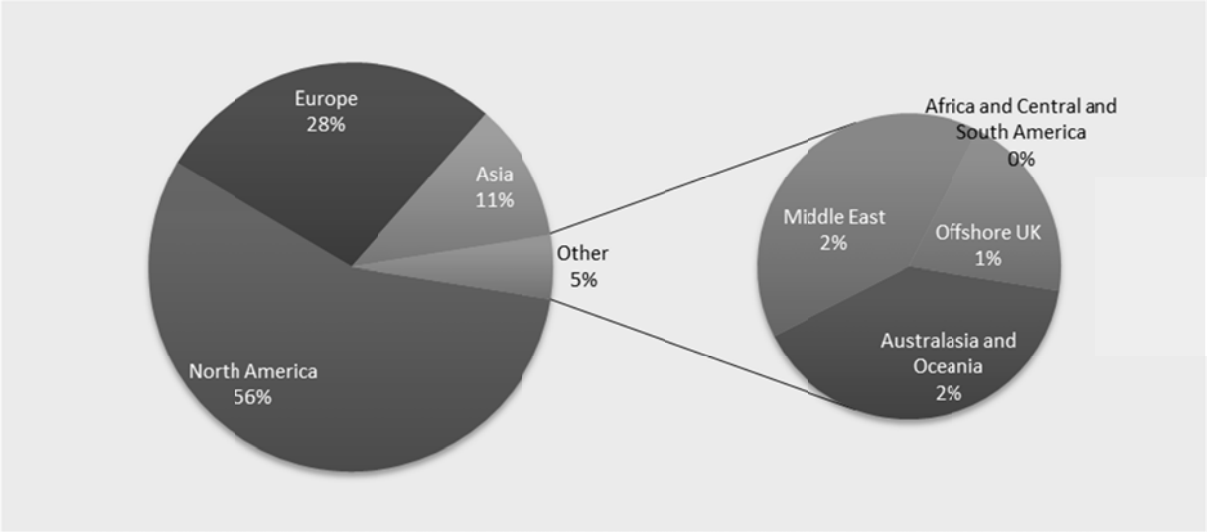
The use of asset managers to manage the portfolios of institutional investors in the UK and elsewhere has, moreover, put an emphasis on short-term returns and arms-length dealings with the companies in whose shares they ultimately have ownership rights. This has been intensified by the extent to which institutional investors themselves have chosen to increase their exposure to investments in hedge funds and private equity funds, alongside the use of index management techniques (Kay, 2012). This increase in relatively passive investment on the part of institutional investors has been associated with a substantial fall across the OECD stock markets in the length of time for which shares are held on average. By 2008 in all the main OECD stock exchanges the average holding period was less than a year and in the case of the USA had fallen from 5 years in the 1980s to around 5 months by 2011. This is consistent with a focus on relatively short time windows in the allocation and reallocation of funds by key investors in the UK and elsewhere (Croce et al., 2011, p.7).

Exhibit 47 Shareholders in Manufacturing Companies



Source Authors calculations based on ONS Share Ownership Data

Exhibit 48 Geographic Breakdown for Rest of the World Holdings of UK Shares in 2010



Rest of the world investors owned 41.2% of the value (or £732.6bn) of the UK stock market at the end of 2010, up from 30.7% in 1998.
At 31 December 2010 the UK stock market was valued at £1,777.5bn.
Source: Authors calculations based on ONS Share Ownership Data ONS (2012)

International Convergence in the Internationalisation of Equity Holdings?

The UK has, as we noted earlier, not been alone in experiencing an increase in the internationalisation of its stock market. In the case of France, the decade following 1995 was associated with a substantial reconstruction of the interlocking shareholding patterns connecting major corporations. Thus, analyses of major networks, such as the BNP network and the Société Générale network, show holdings of these institutions in their so-called "hardcore" industrial groups halved from the late 1990s onwards after being stable or increasing in previous years. This reflects the increasing weight of foreign institutional investors on the French stock exchange (Culpepper, 2005).

The growth of overseas investment in equities has also had a significant impact in Japan. By the early 2000s around 20% of the issued shares of major Japanese corporations were held by foreign institutional investors. This was associated with accompanying changes in governance practices either induced by their presence or introduced in order to make them more attractive for overseas investors (Arikawa and Miyajima, 2007). However, dependence on bank borrowing was maintained as an important element in corporate financing, even though main bank relationships were less well maintained. Nevertheless, it appears that the hard budget constraints associated with bank lending were positively associated with industrial reconstruction attempts in the Japanese economy from the late 1990s onwards. Even so in some circumstances main

bank dependence as opposed to bank lending *per se* may have shielded some corporations by acting as a "softer" budget constraint (Arikawa and Miyajima, 2007; Ahmadjian, 2007).

Finally, Goyer (2011) throws light on the impact of internationalisation on the variety of capitalism hypothesis by examining the investment allocation of short-term investors in France and Germany. Goyer examines the relationship of the pattern of their investments to the evolution of corporate governance in those countries. He highlights hedge funds and actively managed mutual funds as short-term investors. His analysis focuses on equity stakes above 5% held by these UK and US type investors in French and German corporations from 1997 to 2009. The analysis covers the 60 largest firms in both France and Germany in terms of stock market capitalisation in 2003. The upshot of the analysis is that these *impatient* shareholders have targeted France over Germany in the ratio of 2:1. Thus out of the top 60 French firms by market capitalisation there were 39 instances of holdings in excess of 5% in the top 60 French firm compared to only 19 instances in the German case. The pattern of mutual fund holdings which had low average turnover rates in their portfolios (and therefore could be considered medium- or long-term oriented investors) were much closer between the two economies. There were 59 instances in the case of France and 42 in the case of Germany. Goyer attributes this pattern to the relatively constrained chief executive and senior management decision-making capacities in the stake holder based German system compared to the increase in chief executive operating freedom associated with recent evolution in the French corporate governance system. In keeping with the emphasis on complementarity in institutional design he shows the extent to which labour market coordination mechanisms, including vocational training, firm level works council adjustments and experimentation with work organisations have been consistent with the German system's focus on agreed coordinated change in incremental innovation. This is contrasted with a relatively exclusionary series of corporate governance developments in France.

These analyses suggest some evidence of convergence toward external stockholders based systems in France, but a more resistant response in Japan and Germany (see also Buchanan et al, 2012). The UK differences with the latter two systems may therefore be persistent in coming decades.

8. Dispersion of Shareholdings in the UK and other Countries

So far we have focused on shareholding by broad category of holder. Governance systems and interpretations of insider/outsider models also emphasise the dispersion of shareholdings, with more concentrated shareholdings implying potentially greater and more effective force in governance arrangements and, a lower, inclination to 'passive' shareholding and arms-length relationships.

Analysis of shareholding dispersion for the US (where the data analysis covers both the top 500 and a larger sample of 3,000 listed companies), the UK, Denmark, Finland, Norway, Sweden, Germany, Japan, South Korea and France are shown in Exhibit 49.

The analysis looks at the distribution of individual holdings of over 10% of the stock of a company. Where there is no single holder of 10% or more, a company is described as having a dispersed shareholding pattern. This is shown in the final column. Only 2% of the German sample and 3.7% of the French sample have companies without a single holding over 10%. In contrast, in the UK over 28% of companies have no such single holding and in the case of the largest 500 US firms that was true in 42% of the cases. In Japan and Korea around 30% of companies have no single block holdings over 10%. Although the holding company structures in those countries are well known, they have a much higher proportion of "dispersed" ownership than is the case in France and Germany. Similarly, the size of the largest holding in Japan and South Korea is much less than is the case in Germany and France and is similar to that in the UK. There is thus no simple reading across from groupings in terms of liberal market and coordinated market economies in terms, for example, of bank finance to groupings in terms of dispersed shareholdings.

Exhibit 49 Company Shareholdings: the Median Size of the Largest Shareholding and the Distribution of Companies by the Identity of the Largest Shareholding Over 10%

Country	No. firms	Median largest holding over 10%		% of Companies where the largest shareholder with over 10% of the stock is:				% of companies with no holdings over 10%
				Family holdings	A Financial holding	A Non-financial holding	A State holding	Dispersed holdings
UK	687	11.8		17.9	37.0	15.1	1.8	28.2
US	3,070	16.8		47.3	25.9	14.6	0.9	11.3
US (largest)	500	11.0		12.4	43.2	18.6	0.2	42.6
Denmark	40	15.0		25.0	12.5	25.0	2.5	35.0
Finland	34	20.7		5.9	17.6	38.2	23.6	14.7
Norway	42	26.9		16.7	23.8	47.6	7.1	4.8
Sweden	54	25.0		16.7	38.9	33.3	3.7	7.4
Germany	240	51.7		26.7	15.4	48.8	7.0	2.1
Japan	1,036	8.9		5.9	6.6	58.1	0.2	29.2
South Korea	16	12.8		25.0	6.3	25.0	12.4	31.3
France	187	50.0		25.1	17.6	51.3	2.3	3.7

Source: Adapted from Gugler et al. (2004). The sample consists of firms listed on a public stock exchange and is drawn from the Global Vantage database. The various sources of ownership data include Worldscope, Amadeus, SEC, and *Wer gehört zu Wem?* Most data refer to 1995/6; Germany: 1985-2000; USA: 1991-8; Japan: 1987-98; UK: 1992-8.

Financial institutional holdings are much more important in the UK, US (especially the largest firms), Norway and Sweden than is the case in Denmark, Finland or Germany and, especially, in Japan and South Korea. The counterpart to this is a much greater significance of companies with large non-financial holdings over 10%. Thus, 58% of Japanese companies and 48% of German companies had a largest shareholder holding over 10% of the stock which was a non-financial company. Such companies are much rarer in the UK and the US. This pattern is consistent with a more 'coordinated' system in the case of Germany and Japan.

Where holdings over 10% exist, it is noticeable that family holdings still persist so that substantial proportions of companies in all economies, except Finland, have large family holdings over 10%. This is a neglected feature of discussions of varieties of capitalism which deserves more attention than it has hitherto received.

Summary Conclusion on Financial Systems and Shareholding

This review of structural features of financing and shareholdings suggest that at a national level we might still expect businesses to be funding R&D and innovation in distinctive national contexts. There has been some convergence in features over time, but what remains perhaps more compellingly is that differences in financial structures and in financing and ownership patterns remain. This is so especially in terms of bank funding and patterns of block holding. This suggests that differences in financing for innovation and the incentives and constraints faced by decision makers therefore may be expected to occur across countries. Moreover, the importance of internal financing means that national stock markets "matter" insofar as they impose short-term pressures on corporate decision makers to avoid, for example, takeover pressures. The evidence as to whether UK capital markets can be shown to exhibit short-termism in relation to long-term investments in innovation in manufacturing in an absolute or relative sense is discussed in the next section.

9. UK Equity Markets and Short-Termism

> *"Short-termism in business may be characterised both as a tendency to under-investment, whether in physical assets or in intangibles such as product development, employee skills and reputation with customers, and as hyperactive behaviour by executives whose corporate strategy focuses on restructuring, financial re-engineering or mergers and acquisitions at the expense of developing the fundamental operational capabilities of the business."*
>
> Kay (2012) p.10

The idea that UK capital markets and corporate decision takers exhibit short-termist or myopic attitudes in relation to investment decision is of long-standing.[18] The essence of the argument is simply put. If individuals or businesses are compared and one places a relatively lower value on income streams earned in the future compared to another, then the former exhibits relatively myopic tendencies. There may be a large number of reasons for there to be a discount applied to future earning streams, not least for example

concerned with the likelihood of individuals surviving to enjoy them or, more generally, the desire to consume jam today rather than jam tomorrow. For UK investment and financing decisions to be relatively myopic and for this to have a detrimental effect on UK economic growth and welfare, it is necessary to show that UK financial markets and investment decision-makers have a higher rate of discount for future earnings than similar decision-makers in other countries. For this to be a problem, it is also necessary to explain how this has a deleterious effect on the kind as well as on the amount of investment undertaken. In the presence of very high rates of discount of future earning streams, long-lived assets and those which generate their returns in a disproportionate way towards the end of the path from development through to investment and sales will be disadvantaged. The argument has particular force in relation to investments in R&D. This is because R&D projects are likely to have returns with those returns more heavily concentrated towards the end of their overall life cycle. The link between myopic decision taking and R&D and innovation activity is therefore of particular concern.

Attempts to measure the degree of myopia in the UK and its extent relative to other countries rely on two sorts of evidence. One sort is based on questionnaire and interview analyses of the attitudes of corporate decision-makers. This focuses on the extent to which they perceive that their actions are judged by financial market investors in a way which will penalise long-term investments compared to short-term investments. It is important to note that these perceptions may not need to be based on an objective state of affairs in the market. It is sufficient that they are perceived to be the case for corporate decision taking to be effected. An alternative approach is to look at movements in share prices and assess the extent to which they follow a path which would be consistent with applying “appropriate” rates of discount to the future earning streams and final capital values of the companies which issue them. This approach basically involves discounting future dividends back to current values using rates of discount which would be “appropriate” in the sense that they reflect a risk free rate and a risk adjustment element based on the observable risk characteristics of the relevant company whose decisions are being examined. To the extent that current share prices are less than would be expected using those discount factors, then the implication is that the market is discounting future returns too heavily. It is acting myopically and attributing too low a present value to the future earnings stream.

We examine evidence for the UK on both these bases and also review comparative international evidence. This allows us to see whether there is evidence of short-termism in terms of perception or practice, whether it has been increasing, and whether the UK appears to be more susceptible to short-term or myopic influences than other countries.

9.1 Survey Based Evidence of Short –Termism

Grinyer et al (1998) surveyed the finance directors of 246 Times 1,000 companies in 1991. Exhibit 50 tabulates the responses to 7 statements capturing potential short-termist perceptions. The exhibit shows the percentage agreeing strongly or agreeing; the percentage disagreeing or disagreeing strongly; and the balance between those two. There is a substantial spread of opinions, but in each case the balance agreeing or strongly agreeing with perceptions of short-termism is positive.

Exhibit 50 Responses of UK Quoted Company Finance Directors to Statements about R&D Decision-Making and Capital Market Reactions 1991

	(1) % Agree or Strongly Agree	(2) % Disagree or Strongly Disagree	Balance (1)-(2)
Top management will not accept proposals for increasing expenditures in research and development if it results in a significant fall in profits from the previous year	49.2	34.3	14.9
Top management will not accept proposals for increasing expenditures in research and development if it results in a significant shortfall in earnings growth below capital market expectations	53.3	30.2	23.1
Top management will not undertake a product development project if it results in a significant fall in profits from the previous year	43.8	35.1	8.7
Top management will not undertake a product development project if it results in a significant shortfall in earnings growth below capital market expectations	49.4	29.5	19.9
A 10% increase in expenditure on research which results in a 15% reduction in the net earnings figure expected by the capital markets will adversely affect a company's share price	56.0	17.4	38.6
The undertaking of an innovative project which results in a 15% reduction in the net earnings expected by the capital markets will adversely affect a company's share price	67.1	18.1	49.0
The capital market values companies primarily by reference to the current year's prospective earnings	66.3	21.0	45.3

Source: Authors calculations based on Grinyer et al. (1998) Tables 2 and 3, pp. 19-20. Views are those of the Finance Director of 246 Times 1000 UK Companies responding to a postal questionnaire survey in 1991. Of the sample 47% operated in 2 or more industrial sectors, 37% were in manufacturing, 9% in property and building firms and 7% in retailing. There were no significant differences in responses by sectors, business, size or speed of response to the survey.

Demirag (1998) conducted a postal survey of directors of 226 of the largest companies listed on the UK R&D Scoreboard for 1992. His analysis consists of responses to a number of statements reflecting the perception of capital market short-termist pressures. It then provides a cross-correlation of those perceptions of pressures with directors' statements of factors, such as sales, profits and company objectives, influencing the sizes of their R&D budgets.

Exhibit 51 shows the responses to the questions relating to perceptions. These provide quite a mixed picture and the balance between those *agreeing* or *agreeing strongly* with suggestions of short-termist pressures are outweighed by those *disagreeing* with the perception of short-termist pressures in three out of the five statements considered. By itself this is weak evidence for the existence of perceptions of short-term pressures. However, Demirag is more interested in the spread of perceptions and how differences in perceptions may in turn be related to the directors' statements of the factors which influence the scale of their R&D activities.

Exhibit 51 R&D intensive Company Directors' Perception of Pressures from Capital Markets in the UK 1992

	(1) % Agree or Strongly Agree	(2) % Disagree or Strongly Disagree	Balance (1)-(2)
It is difficult to provide profit figures which satisfy shareholders while funding R&D projects which are right for the business	31.5	45.5	-14.0
We frequently experience pressures for short-term profit maximization from our owners and therefore sometimes cancel projects which ought to be undertaken in the long-term interest of the company.	33.4	48.3	-15.1
Analysts and major shareholders are able to make decisions based upon adequate technically informed analysis of the quality and value of R&D undertaken	22.4	52.2	-29.8
Analysts and major shareholders often exhibit a strong bias against high-risk long-term research in favour of lower-risk short-term product development	51.1	19.5	31.6
My company is perceived as being a possible candidate for take-over and this exacerbates the problem of pressures to deliver short-term profits at the expense of long-term R&D	20.5	56.5	-36.5

Source: Authors calculations based on Demirag (1998) Table 2, p. 205. 226 R&D Scoreboard Companies.

Exhibit 52 reproduces Demirag's findings on the factors affecting the R&D budgets decision. The first two rows relate to last year's sales and last year's profit respectively which may be taken as short-term decision criteria, whereas the third row (company objectives for growth and market share) are interpreted as more longer term objectives. Answers are on a scale ranging from 1 of no importance to 5 crucial. The balance of companies scoring 4 or 5 compared to those scoring 1 or 2 suggests short-termism in relation to profits, but not in relation to the other two. When a correlation analysis is carried out, linking perceptions of pressures from capital markets to factors determining the size of the R&D budget, those businesses most likely to have strong perceptions of market short-termism in Exhibit 52 on each measure are also those which are

emphasising last year's sales and profits as key factors determining the size of the R&D budget.

Exhibit 52 R&D intensive UK Quoted Company Directors' Views of Factors Determining the Size of the R&D Budget 1992

Control mechanisms	Frequency					Total	Mean
	Of no importance				Crucial		
Rate each of the following as determinants of the size of the R&D budget	**1**	**2**	**3**	**4**	**5**		
Last year's sales	37	59	69	47	10	222	2.703
	16.7%	26.6%	31.1%	21.2%	4.5%	100.0%	
Last year's profit	23	35	73	68	22	221	3.140
	10.4%	15.8%	33.0%	30.8%	10.0%	100.0%	
Company objectives for growth, market share, etc.	6	9	37	107	63	222	3.955
	2.7%	4.1%	16.75	48.2%	28.4%	100.0%	

Source: Authors calculations based on Demirag (1998). 226 R&D Scoreboard Companies

Marston and Craven (1998) also carry out a survey of corporate perceptions of short-termism for the year 1991. They survey a sample of 547 companies by market value drawn from Datastream and the Financial Times UK top 500 list of companies in 1991. This sample is wider than the sample considered by Demirag since it is not focused solely on those companies listed as significant R&D intensive companies. They focus on responses to a set of questions concerned with finance directors' perceptions of the attitudes of three types of financial analysts. These are sell-side/brokers' analysts, buy-side analysts and fund managers. The first category are essentially stockbrokers working in research departments, the second category are investment analysts working for institutional investors and the third category are individuals working for institutional investors who may have analysts reporting to them. They report the results for sell-side analysts and buy-side analysts and these are shown in Exhibit 53. The evidence presented shows that only a minority of finance directors perceive the market as too short-termist. The paper therefore goes on to examine the extent to which perceptions of short-termism amongst the

sample are related to company characteristics which indicate vulnerability to the effects of short-termism. They find that directors of companies in the capital goods sector are significantly more likely than other companies to perceive that sell-side analysts are not sufficiently interested in long-term prospects and that sell-side analysts are over-concerned with the short-term profit opportunities. This was not the case in relation to buy-side analysts or fund managers. They were unable to find any relationships between size of company and short-term perception nor between share price volatility or the ratio of marketable value as a proxy of vulnerability to takeover. In a multivariate analysis allowing for interactions between these indicators of company vulnerability, the capital goods sector variable was again the most important. Moreover, a positive relationship with share volatility also emerged.

Exhibit 53 Finance Directors' Perceptions of Short-termism in Large Quoted UK Companies 1991

	(1) % Agree or Strongly Agree	(2) % Disagree or Strongly Disagree	Balance (1)-(2)
Sell-side analysts are too concerned with short-term profit opportunities	59.9	22.1	37.8
Sell-side analysts are not sufficiently interested in the long-term prospects of my company	40.3	40.1	0.2
Buy-side analysts and fund managers are too concerned with short-term profit opportunities	21.1	52.9	-31.8
Buy-side analysts and fund managers are not sufficiently interested in the long-term prospects of my company	13.8	65.7	-51.9

Source: Authors calculations based on Marston and Craven (1998) Table 2, p. 242. 547 companies from Datastream and Financial Times Top 500 in 1991

Kay reviews a wide range of other qualitative evidence on the forces which lie behind the perceptions and whether the way in which shares are managed has exacerbated the situation over time. He argues that shareholders have become increasingly divorced from active involvement in the companies whose shares they hold and that these and other factors have been conducive to arms-length passive short-termism shareholder behaviour.

He concludes that

> *"Asset managers – specialist investment intermediaries – have become the dominant players in the investment chain, as individual shareholding has declined and pension funds and insurers have responded to incentives (including demographic changes and regulation) to reduce their investments in equities. Asset managers typically play a key role in exercising the attributes of share ownership most relevant to company decision-making: the right to vote and the right to buy or sell a given share."*
>
> Kay (2012) p.11

> *"The appointment and monitoring of active asset managers is too often based on short-term relative performance. The shorter the timescale for judging asset manager performance, and the slower market prices are to respond to changes in the fundamental value of the company's securities, the greater the incentive for the asset manager to focus on the behaviour of other market participants rather than on understanding the underlying value of the business."*
>
> Kay (2012) p.11

> *"We conclude that the quality – and not the amount – of engagement by shareholders determines whether the influence of equity markets on corporate decisions is beneficial or damaging to the long-term interests of companies. And we conclude that public equity markets currently encourage exit (the sale of shares) over voice (the exchange of views with the company) as a means of engagement, replacing the concerned investor with the anonymous trader."*
>
> Kay (2012) p.10

Taken as a whole, this evidence suggests pervasive perceptions of short-termist pressures by UK corporate decision takers and that these are of long standing. Moreover, they are consistent with objective trends in the underlying manner and nature of the management of equity assets in the UK stock market. These perceptions and asset management practices are consistent with a financial market which will inhibit the kind of long-term capital intensive innovation expenditure necessary for manufacturing to thrive.

9.2 Econometric Estimates of Short-Termism

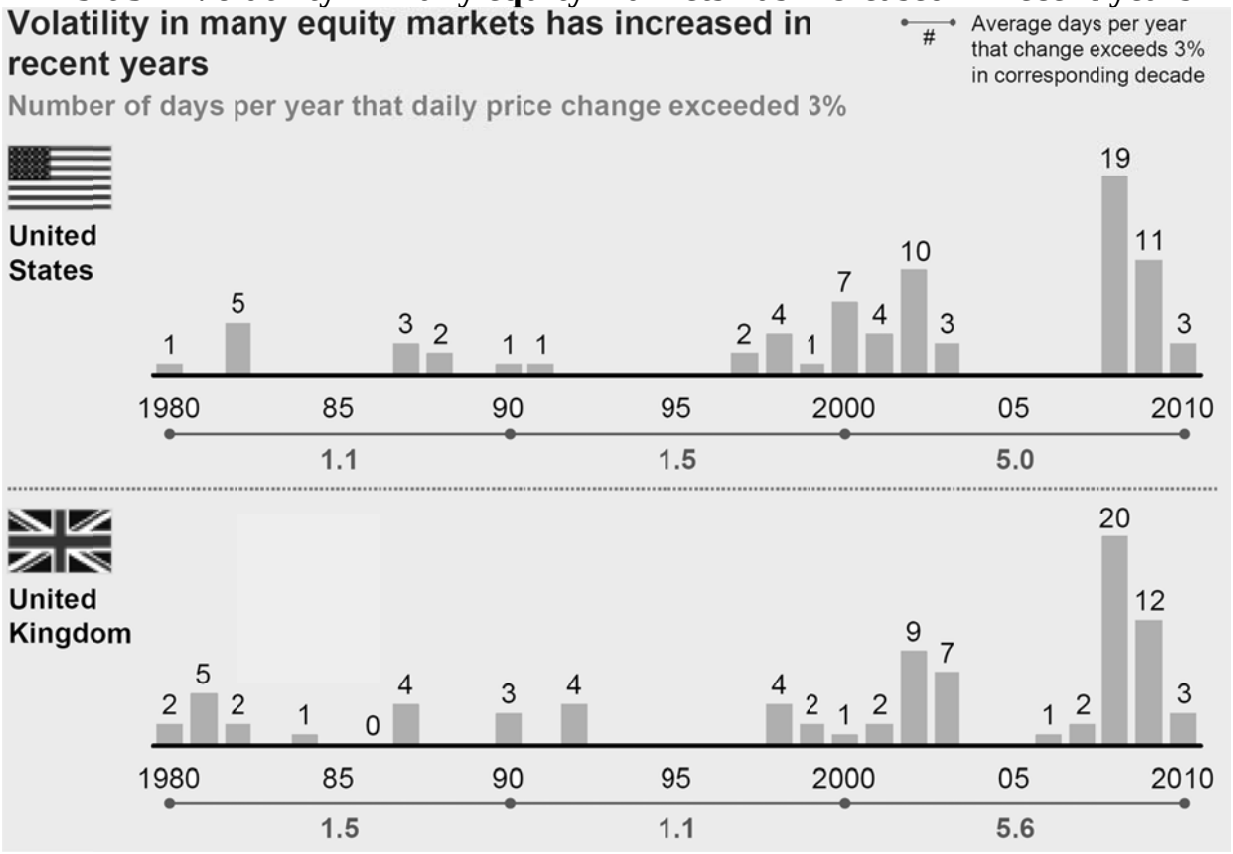
Miles (1993) analyses a sample of 477 UK non-financial firms over the period 1980-1988. The sample accounts for around a half of the market value of all UK quoted companies. Current share price is explained in terms of future dividends and end year share price. These are represented in the estimated equation of the determinants of current share prices by instrumental variables based on lagged share prices, lagged dividends and lagged earnings per share. The effects of myopia are identified by comparing the estimated coefficients on these future earning streams with a discount rate based on a company risk adjusted market rate of discount. A coefficient of less than 1 implies myopia. The analysis shows a consistent pattern of short-termism. The results imply "that discount rates that apply to longer term cash flows (expressed at an annual rate) are more than 15 full percentage points higher than discounts applied to short-term flows. Put another way, discount rates applied to longer-term flows are about double the rates applied to shorter term flows." (Miles, 1993, p. 1390). In every year, apart from 1981, the parameter measuring the degree of short-termism was below 1. The average estimated value of the short-term myopic parameter was around 0.9 which implies that cash flows accruing six months in the future are underestimated by 5% relative to non-myopic discounting. Cash flows which do not accrue for five years are "systematically underestimated by almost 40%". (Miles, 1993, p. 1394). In effect, projects with five years to maturity would need to be around 40% more profitable using the myopic discount rates than would be optimal using non-myopic rates.

Haldane and Davies (2011) update the econometric analysis of Miles (1993). Their data set consists of a panel of 624 firms listed on the UK FTSE and the US S&P stock markets over the period 1980-2009. The sectors include both financial and non-financial industries. As in Miles (1993) lagged share prices, lagged dividends per share, and lagged earnings per share are used as instruments for future dividends and equity prices along with estimates of company risk measured by beta values and gearing. They estimate a similar index of short-termism parameter which indicates the extent to which current share prices differ from those which would be estimated based on the future path of expected dividends given the companies' specific risk profile and an estimate of the risk free rate of discount. Their analysis clearly shows that there was statistically significant evidence of short-termism in the period 1995-2004. This was not the case in the previous decade. This suggests that short-termist influences had increased in importance in the two decade period covered by their analysis. They do not report results separately for the UK and the US so their results for the 1980s are not directly comparable with Miles (1993).

As with Miles (1993) the results of Haldane and Davies are not only statistically significant, but economically significant. They amount to excess discounting of between 5% and 10% per year. These have significant economic impacts. They illustrate the impact of excess discounting of 5% and 10% per year compared to rational discounting (i.e. the risk-free rate plus a company specific premium). They consider an investment project costing $60 and with $10 cash-flow in each of 10 years returned to the investment. Under rational discounting the cumulative discounted cash-flows rise to $61 by year 9. With mild myopia the discounted cash-flows only surpass $60 after 15 years and with severe myopia the $61 payback criterion is never met.

The increase in myopia identified in these studies has been accompanied by a significant increase in stock market volatility in both the UK and the US. This is shown in Exhibit 54.

Exhibit 54 Volatility in many equity markets has increased in recent years



Source: McKinsey (2013) based on data from Datastream; McKinsey Global Institute

9.3 Short-Termism: UK compared to other Countries

There are very few direct international comparisons of short-termism. Black and Fraser (2002), however, analyse the relationship between movements in the stock market indices of major stock markets in Australia, Germany, Japan, UK and USA over the period 1973 Quarter 1 to 1994 Quarter 1. They also disaggregate the analysis for the UK into five broad sectors (resources, general industries, consumption goods, services, and financials). They follow a similar methodology at a country level to that followed by Miles (1993) and Haldane and Davies (2011)using individual company data. They find that in each economy the estimated short-termism coefficient is less than 1 and therefore each market displays myopic characteristics. The UK has, however, by far the highest short-termism estimate. The analysis by sector for the UK shows that the most significant effects of short-termism are found in the financial sector, although each of the sectors displays significant indications of myopia. For the UK the expectations of future cash flows five years into the future are only 13.2% of the rational valuation or 'correct' value. The short-termist estimate for the UK at a country level is much higher for than those reported by Miles and Haldane and Davies using individual company data. Even allowing for a major overestimate it is substantially below the estimates for the other countries. Thus in Germany, for example, the market expectations of future cash flows five years in the future are 96% of the rational or 'correct' value. Both Germany and Japan exhibit lower short-termist tendencies than the US and the UK, although the differences with the US are smaller than those with UK. These results are similar to those of Cuthbertson et al. (1997) for the period 1918-1993.

Exhibit 55 Qualitative Evidence on perceptions and Quantitative Estimates of 'Short-Termism' in the UK

Authors	Time Period	Sample	Method	Illustrative Findings
Grinyer et al. (1998)	1991	246 of Times top 1000 companies	Qualitative survey of perceptions	Balance of answers indicate directors agreement with statements that UK capital market is "short-termist"
Demirag (1998)	1992	226 large companies on UK R&D scoreboard	Qualitative survey of perceptions	Directors perceptions of short-term pressures on R&D spend is positively related to use the last year's sales and profits as determinant of R&D budgets
Marton and Craven	1991	547 large UK companies	Qualitative survey of perceptions	Directors of capital goods companies more likely to perceive that sell-side stock market analysts emphasise short-term performance
Miles 91993)	1980-88	477 UK non-financial companies	Econometric estimate of short-termism	Discount rates applied to long-term earnings flows are twice as high as those applied to short-term flows
Haldane and Davies (2011)	1980-2009	624 large UK and US financial and non-financial companies	Econometric estimate of short-termism	Significant excess discounting of long-term earnings of between 5% and 10% per annum in the period from 1995
Black and Fraser (2002)	1973-1994	Stock Market Index Movements Australia, Japan, Germany, US, and UK	Econometric estimate of short-termism	All sample countries show some myopic excess discounting with UK greatest and Germany and Japan the least
Cuthbertson et al. (1997)	1918-1993	Stock Market Index for UK Equities	Econometric estimate of short-termism	UK market exhibits short-termist excessive discounting

Source: See text for full discussion of the results and their interpretation.

Exhibit 55 summarises the qualitative and quantitative studies we have reviewed. Taken together, these studies provide substantial evidence for both absolute and relative short-termism in UK financial markets. This would imply a bias against long-term innovation intensive investment in UK manufacturing.

10. Does the Short-termism of the UK National Financial System matter for the Financing of Innovation?

There have been a small number of studies which have explicitly focused on micro-analyses of cross country differences in the financing of innovation at the corporate level and which include the UK for comparison with other economies.[19]

Bhagat and Welch (1995) analyse the determinants of corporate R&D in a sample of 1,484 large companies in US, Canada, UK, Europe and Japan in the period 1985-90. They find few differences between US, Canadian, UK and European firms in terms of the influence of debt, stock returns, cash flow or tax liabilities. However, they observe significant differences in relation to Japanese companies where previous debt levels were positively rather than insignificantly or negatively related to R&D expenditures. They conjecture that this suggests that the high debt firms in Japan were not concerned about the implications of the intangibility of R&D in relation to bankruptcy whereas firms in the other countries and in particular small firms in those countries protected their R&D investments by avoiding accumulating large amounts of debt. This is consistent with an insider interpretation of funding for R&D.

Bah and Dumontier (2001) analysed evidence on the cross sectional pattern of corporate policy choices of firms that spend a high proportion of their net revenue on R&D. They compare the behaviour of such R&D intensive firms with non-R&D intensive firms in samples drawn from the US, the UK, Japan and Europe for the financial year ending in 1996. There are around 900 intensive R&D and non-intensive R&D firms in their samples. They find that on a univariate basis there is little to choose between Europe, the UK and the US in terms of their reliance on short-term debt financing which is higher in the case of R&D intensive than non-R&D intensive firms. This, however, is not the case in Japan and they argue that this supports the notion that in the Japanese insider system there is a substantial reduction in information asymmetries between managers and debt providers which enables them to rely to a greater extent on long-term than short-term debt. Thus in the case of Japan alone they find that R&D intensive firms exhibit the same proportion of short-term debt and the same level of dividend payments as non-intensive R&D ones.

Bond, Harhoff and Van Reenen. (2003) analyse the relationship between cash flow, investment in fixed capital and R&D using a sample of 900 firms drawn from the German and UK manufacturing sectors in the period 1985 and 1994. They find that whereas cash flow is positively related to investment in R&D intensive firms in the UK, this is not the case in Germany implying that the

latter variety of capitalism has a financial system which is conducive to investment to R&D intensive businesses. This effect manifests itself in the sense that British firms which do engage in R&D are a self-selected group which significantly better cash flow and where financing constraints tend to be less binding.

Carlin and Mayer (2003) analyse 14 OECD countries (Italy, Japan, Finland, Spain, US, Canada, Australia, Netherlands, France, Denmark, Sweden, Germany, Norway and the UK). They consider the comparative growth and the investment characteristics of 27 industries in those countries over the period 1970 to 1995. They estimate equations which relate respectively growth, fixed investment and R&D to a variety of institutional factors. The analysis is carried out using cross sectional regressions. The right-hand side variables include proxies for information disclosure, concentration of the banking sector, concentration of ownership, each measured at country level, and variables measured at an industry level which capture the extent to which equity financing, bank financing and inputs from other stakeholders are important for industry. Industry measures of the dependence of equity finance are based on US data, bank loans on Japanese data, and skills on German data. The results for R&D are only available for 15 of the 27 industries and for 14 countries. They find that equity dependent industries have lower R&D shares in countries with highly concentrated banking systems and the same is true in relation to R&D shares in skill dependent industries. On the other hand ownership concentration is associated with high R&D in industries which depend on equity and with faster growth in skill dependent industries. It thus appears "concentrated, rather than dispersed, ownership is associated with faster growth of equity and skill dependent industries and with higher R&D shares of equity-dependent industries. These results suggest that it is concentrated (rather than dispersed) shareholders who provide commitments to external investors and stakeholders. (Carlin and Mayer, 2003, p.217). They find, moreover, that the interaction between country financial and ownership structures and industry characteristics is not important for fixed investment whereas it is for R&D. They draw on the work of Rajan and Zingales (2001) to interpret this in terms of the difficulty of collateralising R&D compared to fixed investment. Countries with underdeveloped financial markets and institutions would have to rely far more on collateral. Equally, it could be argued that insider information based systems would face fewer difficulties in supporting decisions to invest in R&D.

Honoré, Munari and van Pottelsberghe de la Potterie (2011) analyse the relationship between governance ratings and R&D intensity in a sample of 279 European companies with R&D activity. They measure corporate governance using an index constructed by a private sector rating agency firm (Vigio). This

index combines indicators relating to board of directors' practices, audit and internal controls shareholders' rights and executive remuneration. The database covers the period 2003-07 and includes 1,315 observations on firms from the UK, Ireland, Germany, France, Belgium and Luxemburg. The firms are in financial services, consumer services, industrial goods and services and the utilities energies sector. The corporate governance index scores more highly practices relating to implementation of shareholder protection measures. They find that corporate governance characteristics related to the performance of the board of directors committees and to audit and control are not related to a firm's propensity to invest in R&D. On the other hand, high corporate governance scores related to enhanced shareholder protection devices and executive remuneration systems have a negative impact on the propensity to invest in long-term R&D projects. They conclude therefore that finance related governance practices intended to enhance responsiveness of corporate strategy to short-term expectation of financial markets will be detrimental to long-term R&D investments. Therefore UK may be expected to do worse and this is consistent with the intra UK study of Driver and Guedes.

In a similar vein Belloc (2013) argues that strong shareholder protection will weaken rather than encourage R&D investments, because their higher specificity will be less highly valued by dispersed shareholders. Enhanced shareholder protection will increase short-term shareholder activism by highly diversified institutional shareholders as well as strengthen the position of minority shareholders. His analysis for 48 countries in the period 1993 to 2006 shows that stronger shareholder protection is associated with larger stock market capitalisation, but also with lower innovative activity. These results are robust to controlling for a variety of other factors and for the sensitivity of the results to a variety of measures of legal systems and innovation performance and imply a weaker performance for the UK.[20]

Manigart et al. (2002) analyse the determinants of the required rate of return in a sample of 200 venture capital companies (VCCs) in the US, UK, Netherlands, France and Belgium. They show, ceteris paribus, that location of a VCC in the UK or the US is associated with imposing a higher required rate of return. This is consistent with relatively high myopia in those countries.

Mayer et al. (2005) analyse qualitative data for 500 venture capital funds in UK, Israel and Germany in 2000 and for Japan in 1999. Their results are not consistent with simple market versus bank based analyses. For example, in terms of the type of investment activity, VCs in Israel and Japan invest predominantly in IT and software whereas in the UK and Germany there is a more even distribution across broad sectors and the two countries are much more alike than Germany is to Japan. Thus, manufacturing and chemicals are

relatively predominant in the latter two countries. Israel has the highest concentration in the single sector, namely IT and software. Similarly analyses of the stage of investment and the significance of institutional holdings of VCs show that the UK and Germany are again more alike than Germany and Japan. The early stage investment by Israeli VC funds (compared to the UK which tends to focus on the latest stages) is inconsistent with the Black and Gilson (1998) view that the stock markets are particularly suited to the higher risks of early stage investments compared to more bank oriented traditional late stage investments. Equally, the similarity of the VC patterns of investment in Germany and the UK are inconsistent with the views, for example, of Allen and Gale (1999) who argue that banks exploit particular advantages in acquiring information in sectors and firms where there is a high degree of agreement about opportunities and returns whilst stock markets permit a wider range of diverse views to be incorporated in investments. This is inconsistent with the similarity with VC investments in Germany and the UK (see also Lerner; 2009). It is in terms of the importance of the internationalisation of VC activity that a striking result emerges for the UK, The UK, has the largest VC market in this sample, and it is also the most international. Around 60% of funds in the UK have some investment outside the UK whereas two thirds of the German funds invest only in Germany or in a German region.

Munari et al. (2010) analyse 1,000 publicly quoted companies in France, Germany, Italy, Norway, Sweden and the UK for the mid-1990s. They find that widely held businesses tend to have higher R&D activity than more tightly held, and in particular family held, businesses. Most significantly from the point of view of the varieties of capitalism hypothesis they find that this positive impact is much weaker in the UK than in other European countries. They link this to the absence of large block shareholders in the UK to act as a buffer against short-term performance pressures in its more dispersed market based governance systems.

Miozzo and Dewick (2002) provide an interesting sector based qualitative assessment of the relationship between corporate governance and innovation. They focus on detailed interviews with major contractors in the construction industry in Denmark, Sweden, Germany, France and the UK. They analyse share ownership and control patterns, the proportion of income derived from overseas, the degree of centralisation and decentralisation of management structures and the forms of cross shareholding. They focus on the way that patterns of ownership finance and management structures affect the interrelationships between stakeholders. They contrast, in particular, the UK where the contractors are principally owned by institutional investors with strong pressures to maintain dividends with Germany and Sweden. In Germany banks, non-financial firms and workers have involvement in an overall

governance structure and labour market context. This facilitates contractors' involvement in long-term research and development and stable labour force contracts. In Sweden banks and family ownership combined with large internal cash flows and overseas expansion have also allowed contractors to develop long-term commitments to R&D while still maintaining dividend payments to shareholders. In contrast the UK exhibits strong short-term pressures to maintain dividends and a lack of more structured governance relationships. This has led to a greater focus on the management and control of construction processes and cost reduction and a lesser focus on investments in new production technologies.

Taken as a whole the studies reviewed and summarised in Exhibit 56 imply a bias against financing long-term innovation related investment in the UK. The evidence has a number of specific implications.

Exhibit 56 Cross-country studies of corporate effects on R&D

Authors	Focus of study	Sample	Illustrative findings
Bhagat and Welch (1995)	Determinants of corporate R&D.	1,484 large companies in US, Canada, UK, Europe and Japan, 1985-90	Few differences between firms in the influence of debt, stock returns, cash flow or tax liabilities, but significant differences in Japanese companies where high leverage is positively linked to R&D
Bah and Dumontier (2001)	Corporate policy choices of firms that spend a high proportion of their net revenue on R&D.	900 R&D intensive and non R&D intensive firms from US, UK, Japan and Europe, 1996	European, UK and US similar in reliance on short-term debt financing which is higher in the case of R&D intensive than non-R&D intensive firms. This is not the case in Japan, which has relatively higher reliance on longer-term debt.
Bond, Harhoff and Van Reenen (2003)	Relationship between cash flow, investment in fixed capital and R&D.	900 German and UK manufacturing firms, 1985 and 1994	Cash flow is positively related to investment in R&D intensive firms in the UK, but not in Germany
Carlin and Mayer (2003)	Comparative growth R&D and investment characteristics of sectors in different financial systems	27 industries in 14 OECD countries, 1970-95	Concentrated, rather than dispersed, ownership is associated with faster growth of equity and skill dependent industries, and with higher R&D shares in industries dependent on equity. Equity dependent industries have lower R&D shares in countries with highly concentrated banking systems
Honoré, Munari and van Pottelsberghe de la Potterie (2011)	Relationship between governance ratings and R&D intensity	279 R&D active European firms, 2003-7.	Governance practices responding to short-term financial market expectations are detrimental to long-term R&D investments.
Belloc (2013)	Shareholder protection and R&D investment	48 countries, 1993-2006	Strong shareholder protection will weaken rather than encourage R&D investments.
Manigart et a. (2002)	Behaviour of venture capitalists	200 venture capital companies (VCC) in US, UK, France, Belgium and Netherlands	VCCs located in UK and US impose higher required returns on their investments
Mayer et al. (2005)	Behaviour of Venture capitalists	500 UK funds in UK, Israel, Germany (2000) Japan (1999)	UK most international in terms of attracting funds and investing UK similar to Germany in sectoral concentrations of investments and stage of investment
Munari et al. (2010)	Owner identity and governance and R&D	1,000 publicly quoted companies in France, Germany, Italy, Norway, Sweden and UK, mid-1990s	Widely held businesses tend to have higher R&D activity than family held, businesses. This positive impact is much weaker in the UK than in other European countries due to absence in the widely held group in the UK of large block shareholders to act as a buffer against short-term performance pressures.
Miozzo and Dewick (2002)	Relationship between corporate governance and innovation	Interviews with major contractors in the construction industry in Denmark, Sweden, Germany, France and the UK	National differences in share ownership and pressures to pay dividends affects investments in new technologies adversely esp. in UK

Source: See references and discussion in the text

The first is that the higher sensitivity of R&D to cash flow in the UK compared to Germany is consistent with the view that UK firms avoid raising external finance by relying more on internal cash flow and may thus be restricted by their own internal profit flows.

Second, variations in financial institutional variables across countries appear to affect R&D more than investment and therefore the specific features of the UK may bear more heavily on its R&D performance.

Third, "high" corporate governance ratings enhance the responsiveness of corporate strategy to short-term financial market expectations and will be detrimental to longer term R&D. Therefore the UK which has 'high' rankings may do worse in terms of R&D and this is supported by analyses of the impact of higher shareholder protection.

Fourth, the absence of large equity blockholdings is associated with a weaker ability to resist short-termist financial market presence, and such holdings are rare in the UK.

Fifth, it appears that UK venture capital companies (along with those of the US) use higher required rates of return than is the case in the Netherlands, France and Belgium. This is consistent with relatively myopic behaviour in the UK. More qualitative analysis focusing, inter alia, on sectoral patterns of investment and distribution of funds across different stages of investment finds fewer systematic differences between the UK and other countries. However, the extreme openness of the UK VC market in terms of flows of funds into and out of the UK means that compared to Germany, for example, the UK VC market is much less focused on the domestic economy, and the development of UK businesses.

11. Financial Systems and Long-Term Investment: Future Scenarios

The evidence on financial structures that has been reviewed suggests a number of trends that will persist in the medium and longer term.

Internal financing of investment will continue to be a core source of funding for investment in tangible and intangible assets including R&D in the foreseeable future. Reforming governance to have a stewardship rather than a shareholder value focus will play a crucial role in resisting increasing pressure for short-

term returns which may rise as a result changes in patterns of long-term investor behaviour.

Thus, the World Economic Forum (2011) provide estimates of the distribution of the assets of long-term investors and their likely future investment stance. Their estimates of current assets of currently long-term oriented investors are as follows: private family investment offices (US$1.2 trillion), endowments/foundations (US$1.3 trillion), sovereign wealth funds (US$3.1 trillion), Defined benefit pension funds (US$11 trillion), Life Insurance (US$11 trillion).

In the future (see World Economic Forum (2011) pp.67ff) they expect family offices, endowments/foundations and sovereign wealth funds to increase in significance. This reflects sales of family businesses and the increasing wealth of high net worth families; donations from such families to endowments; and in the case of sovereign wealth funds, the growing reserves and account surpluses to be transferred to sovereign wealth funds and the increased interest in establishing such funds by emerging economies. On the other hand the traditionally powerful defined benefit pension fund allocation is likely to decline because of the shift from defined benefit plans to defined contribution plans; the associated closure and sales of such schemes to third parties and increases in defined contributions. In addition, ageing populations in countries with established pension systems will involve increased pay-outs and lower proportions of funds under management. They do not anticipate significant changes in life insurance funds and their management as a proportion of the total. This is because they foresee a trade-off between increased wealth in particular and emerging markets which will increase assets and the ageing populations of economies which will increase pay-outs.

In addition to these trends in terms of underlying demographics, a number of constraints are forecast to have an adverse effect on long-term investing capacity. These are related to a reducing appetite for uncertain long-term outcomes on the part of family offices, increasing pressures from trustees and beneficiaries in the case of endowments and foundations as they seek to move away from illiquid investments and an offsetting movement on the part of sovereign wealth funds to slow down investment in risky and illiquid investments. Pension fund investments in the longer term are forecast to be adversely affected by the regulatory changes, including mark-to-market accounting, stricter funding and solvency requirements and maturing liabilities. Similar changes associated with solvency regulations are forecast to affect the policies of life insurers.

The implications for equity markets of these changes are quite substantial and have already led to a substantial reduction in the involvement of pension funds exposure to equities.

In the UK these fell as a % of total pension fund assets from around 70% in the 1990s to less than 40% by 2008 (World Economic Forum (2011) Fig. 18, p.69). In the case of the UK these changes have as we have seen earlier led to an overall decline in the proportion of institutional investment holding of equities in the UK. There has as we have seen been a counterpart rise in the proportion of ownership of UK assets which takes the form of overseas holdings. These, however, include pension and insurance fund and other long-term investors from overseas (as well as corporate and sovereign wealth holdings). Thus institutional investment *per se* may not have fallen so dramatically as the broad trends in shareholding patterns in the UK indicate. On the other hand, the fact that these investors are overseas means that it is even less likely that they will be engaged in more direct relationships with the companies whose shares they hold than UK institutional investors have been. There is also evidence to suggest that they are under similar short-termist pressures as their UK counterparts.

In the medium to long-term the prognosis for the UK in the absence of counterveiling policy initiatives is for persistent short-termist pressures and a lower rate of long-term innovative investment in manufacturing than might otherwise be the case.

12. Convergence in Financial Systems and the Finance of Innovation

The idea that convergence in financial and governance systems across capitalist economies was inevitable as a result of the superior performance of the English legal origin stock market based systems has been widely canvassed (see, for example, Baumol, 2002, and Hansmann and Kraakman, 2004). The evidence we have reviewed suggests that this convergence and the triumph of a particular system of stock market financial relationships and governance is exaggerated. Significant differences remain between financial systems. Whilst these differences do not lead to simple characterisations in terms of ideal types of varieties of capitalism, they do suggest significant differences between nation states.

These differences are significant in relation to policy debates about the future structure of industrial economies in the aftermath of the global financial crisis. Economies, such as the UK and the US which are seeking to rebalance their

economies away from the services sector, face major challenges in terms of the financing of long-term R&D. To the extent that the evidence we have reviewed suggests that more coordinated patient capital structures are productive in terms of investment in R&D and innovation, then care is required in focusing on systems which depend on stock market financing and arms-length relationships alone. The importance of the public sector in the US and the UK also points to the importance of the potentially strategic role that public sector investment can play in 'liberal' market economies.

Even if market and/or socio-political forces for convergence persist, the evidence suggests that there will be significant obstacles to overcome in imposing a one-size-fits-all solution. First of all, in some cases, aggressive attempts to impose shareholder activism through, for example, hedge fund activity has in the case of Japan led to a reassertion of the benefits of firm-centric governance structures. This has re-emphasised the importance of the firm and its long-term performance rather than the short-term financial needs of particular groups of equity holder (see, for example, Buchanan et al., 2012). More generally, analyses which focus on issues of complementarity between institutional forms in different components of the economic system have emphasised that change in one dimension may be slow. They will also be ineffective unless they are combined with, or are congruent with, changes in other sectors. Thus, for example, the introduction of shareholder norms of behaviour associated with dispersed stock market systems may be ill-suited to the development insider systems emphasising more coordinated forms of labour market process. They may also sit uneasily alongside governance structures which embed stakeholder representation and participation. The process by which new or changing norms of behaviour associated with shareholder maximisation may infiltrate previously coordinated or insider systems will also be diverse. They will depend on the role played by groups with varying elements of power, both in the corporate governance system and in the political system more generally (see, for example, the discussions in Gordon and Roe, 2004; Amable, 2009; and Dore, 2000). To the extent that these differences persist and influence the financing of research and development and innovation, we may expect differences in innovation performance across firms and their national contexts to also persist. In the case of the UK this would imply a persistent constraint on long-term investment in innovation in manufacturing

A critical issue for the UK is whether perceptions and the finance and governance system can evolve away from short-termism pressures. Different national systems, however, have embedded in them factors which will predispose them to react to shocks in ways which are consistent with the established beliefs and practices of the firms and workers in those economies (Hall and Gingerich, 2009). Thus in response to an external shock a liberal

market economy, it may be hypothesised will seek to pursue even more liberal market policies by more deregulation. On the other hand, in coordinated market economies the reverse is posited to be true.

In thinking about the next 30 years, the question is whether a liberal market economy such as the UK will be better served by more of the same or by an attempt to alter structural characteristics which inhibit the future development of the economy. This is precisely the area in which the debate about industrial policy is now being conducted in the UK and elsewhere. It should lead to a fundamental re-examination of the way in which intermediate coordinating organisations can themselves be created in LME varieties of capitalism.

Current industrial policy debates emphasise the need to develop strategies around the allocation of resources to strategic sectors. Insofar as those sectors and technologies involve the accretion and consolidation of wide ranges of knowledge and expertise then the development of institutions (e.g. catapult centres) which have the potential to assist in these connections, become a central part of industrial policy.

The great interest in such intermediate institutions in the UK (and the USA) at present indicates the extent to which this message is being absorbed into industrial policy debates. In this connection the fact that economies characterised as liberal market economies and coordinated market economies each contain within them sectors which are characterised as both experiencing radical and incremental innovation means that a view will need to be taken on a much more granular basis of the particular factors likely to inhibit or encourage innovation in each sector. Basing policy on an aggregated view of how the economy looks on average, or on its inherited structure from the past seems less helpful. The challenges facing the development of such a disaggregated and medium to long-term policy in the UK are discussed in a companion report for the Future of Manufacturing Project (Crafts and Hughes, 2013).

Notes

1 Lazonick has, however, argued that patient financial commitment is essential for the support of a productive innovation process in a stock market system and that when this is lacking the "virtuous" circle is broken. In his view an appropriate framework for analysing the function of the stock market must be broken down into the analysis of five sub-functions, namely the creation, control, and combination of assets, patterns of compensation and the role of cash and the implication of these for high technology industries in particular. In a series of contributions he has argued that the way these functions operate may vary significantly both over time, in a particular national system and within the corporations in different sectors. His analysis in particular points to the view that the US stock market in recent decades has been over-focused on cash and compensation in the pursuit of managers' self-interests. This has been at the expense of the development of a framework of financing and governance capable of supporting long-term investment in high-risk innovative environments (see, for example, Lazonick, 2007, 2009 and the references therein).

2 The institutional characteristics measure employment protection; the average length of employment contracts; collective bargain coverage; occupational training; graduate rates in tertiary education; cross-border and domestic joint ventures and alliances relative to GDP; the market value of cross-border mergers and acquisitions relative to GDP; and stock market capitalisation of indigenous firms (excluding mutual funds) as a share of GDP.

3 BIS, 2011b, also provides comparisons UK across several input and output dimension with US, Sweden and Germany. The UK lags each in terms of the two output variable analysed (Triadic Patents and % of firms with new to the market product innovation.

4 The UK ranks higher on the more complex Global Innovation Index which combines inputs and outputs, but this reflects its relatively high performance in terms of citations of academic papers, and university quality. It scores less well in terms of labour productivity growth (rank 102 in 2011) and gross capital formation rated 127th in 2012).

5 The Innovation Output index is a weighted composite of patents per billion GDP; trade performance in medium and high tech goods; trade performance in knowledge intensive services, and % of employment in fast growing firms in innovative sectors (EC 2013).

6 Support for this latter measure of radicalness is provided in Schoenmakers and Duysters (2010). For a useful critique see Taylor (2004).

7 Such indicators compare the share of an industry in total exports in a country to the share of that industry in total country exports in the whole sample of countries being analysed. Allen et al. (2006) scale this variable to have values between -1 and +1.

8 There is in general a problem with classifying whole sectors as radical or incremental, since sectors may be characterised by a relatively preponderance of each type at different stages of the sectors' development or transformation (see e.g. Taylor, 2004).

9 They use export shares or indices of revealed comparative advantage for sectors grouped into high-tech and medium high-tech sectors respectively based on an OECD classification using measures of R&D and technological intensity.

10 It is interesting to note that there is some evidence that overseas investment by UK companies in the US has allowed them to access knowledge spillovers from the US R&D effort and enhance their productivity performance (Griffith et al., 2006).

11 The latest data for public sector funding of R&D in manufacturing in the US is for the year 2000. Data is not available for Germany on this basis after 1999. However, in that year the share of the public sector in funding manufacturing R&D was exactly the same as the public sector share in funding business R&D as a whole. The data for Germany shown in the exhibit assumes that the share of manufacturing R&D financed by the public sector in that year was the same as the public sector share of business R&D as a whole.

12 Differences across countries may reflect differences in the extent to which subsidiaries are specifically created to carry out R&D, but there is no systematic comparative evidence to suggest whether this biases the results in Exhibit 30.

13 For a detailed review of UK merger activity in the period 1950-1990 see Hughes (1993) and for a review covering subsequent UK studies and the role of governance in (not) influencing outcomes see Cosh and Hughes (2008) and Cosh, Guest and Hughes (2008) and for the impact of takeovers on innovation *per se* see Desyllas and Hughes (2010).

14 International comparisons of financial and governance systems are fraught with empirical and conceptual difficulties. Divergent results can occur both because conceptual categories differ or are very loosely defined. Major efforts at standardising national accounts flows of financial funds data and at developing measures of financial markets scale and depth have improved matters over time (see, for example, Byrne and Davis, 2002; Demirgüç-Kunt and Levine, 2004). So too have major efforts been made to increase the range and quality of data on share ownership patterns and the 'quantification' of legal codes (see, for example, La Porta et al., 1998, 2008; Armour et al., 2009; Gugler et al., 2004; Goyer, 2010; Morgan, 2010). Nevertheless significant differences between studies may be accounted for by differences in the availability and form of data and more recent studies are more likely to reflect the impact of more and better data.

15 The exhibit focuses on the first decade of the current century. It is therefore affected by the financial crash. A separate calculation for the period 1991-2000, however, revealed almost identical rankings so that the characterisation based on the first decade of this century is a relatively stable one.

16 As we have discussed above in the case of the UK, the global financial crisis of the first decade of the 21st century was followed by a significant fall in bank lending to the corporate sector as the banking sector retrenched. Large corporations responded by increasing equity and especially bond issues largely supported by the Bank of England's active intervention to support this market. On the other hand, initial public offerings or first time equity issues collapsed. The crisis in the case of the UK and elsewhere has led to particular difficulties in the case of small and medium-sized enterprises where the pressure on banks to reconstruct their balance sheets has increased the tension between pressures to increase lending for smaller businesses and the pressure to improve the stability of the banking system (see, for example, Wehinger, 2012).

17 See, for example, O'Sullivan (2003); Goyer (2011) and Culpepper (2005).

18 See, for example, BIS (2011a) and the discussion and sources listed in Miles (1993), Myners (2001), Haldane and Davies (2011), Kay (2012) and Rose (2013).

19 Hall and Lerner (2010) review a large number of studies which are predominantly focused on analysing financial constraints on R&D funding *within* countries, but also include some international comparisons. They conclude that *""Anglo-Saxon" economies, with their thick and highly developed stock markets and relatively transparent ownership structures, typically exhibit more sensitivity and responsiveness of R&D to cash flow than continental economies; third, and much more speculative, this greater responsiveness may arise because they are financially constrained, in the sense that they view external sources of finance as much more costly than internal, and therefore require a considerably higher rate of return to investments done on the margin when they are tapping these sources."* This is consistent with a short-termist bias in these markets. They also suggest that this excess responsiveness may be a rapid response to demand signals and that this 'excess' responsiveness occurs *"because firms are more sensitive to demand signals in thick financial equity markets; as a result they conclude that it is a definitive explanation of the "excess sensitivity" result awaits further research."* This alternative explanation is less consistent with the qualitative evidence we have reviewed on management perceptions or asset management practices and in the market for corporate control than the myopia explanation. Nor would it easily explain the increasing volatility of equity markets over time.

20 This is confirmed in the case of the UK in the study by Driver and Geddes (2012). They investigate the determinants of R&D expenditure in a sample of high R&D expenditure UK listed companies in the period 2000-05. They form a corporate governance index for each company which is the sum of a set of 0/1 dummy variables over 6 different governance components. These components include board size, the separation of CEO and chair of the board, whether or not the company observes the Higgs code of practice, whether a clear majority of directors are independent or non-executive directors, whether or not the bonus component of total executive pay is over 20%, and whether or not the stock options component of total compensation is over 30%. They also separately calculate a set of stock ownership variables which, again, is a set of dummy variables equal to 1 where at least one shareholder is holding more than 5% of the total stock or where the chief executive share ownership is over 1%. They report an inverse relationship between R&D and 'better' corporate governance.

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