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Learning from some of Britain's
successful sectors: An historical
analysis of the role of government

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Foreword

Notwithstanding the growth of experimental economics in recent years, for the economist, history remains the laboratory through which we are best able to seek to understand how different policies might impact on economic performance. The recent global financial crisis in particular has reminded us how analysis of past periods of economic history can be invaluable in informing contemporary policy questions.

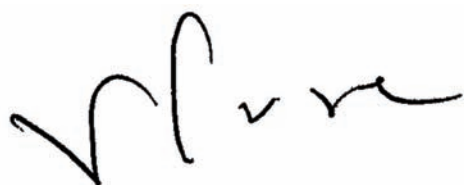
In April 2009 the Government set out in *New Industry New Jobs* a strategy to strengthen the UK's industrial policies and support future growth. In order to develop and successfully implement the strategy we commissioned some of the UK's leading economic historians to help us gain a better understanding of the role Government policies may have played in helping us build a number of our globally successful industries.

Despite the care that needs to be taken in translating observations between both sectors and historic periods, there are a number of broad lessons that stand out: the importance of access to a large domestic market, in some cases aided by intelligent procurement; the role in some industries of agglomerations or clusters; responsive and supportive regulatory frameworks; and the underlying importance of horizontal policies, particularly on skills and infrastructure.

In terms of thinking about the sectors in which the UK is most likely to enjoy growth opportunities in future years, Nicholas Crafts' observations around the comparative growth of pharmaceuticals and decline of textiles in the second half of the last century provide a timely reminder of the importance of considering our strengths in comparison to rapidly changing global competition.

Assessing the impact of Government policies is always made difficult by the absences of a counter-factual – in other words what would have happened if the policy had not been in place. In some cases, authors have challenged the role that Government has previously played. We welcome this debate as part of our role in building the evidence base, although of course the opinions published here remain those of the authors and are not official Government views.

Whether you are involved in business, policy making or academia, I hope you enjoy these fascinating accounts of how some of our leading industries developed and reflect upon how we might draw on these experiences to help Britain build and maintain globally successful industries in the years ahead.



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1. Overview and Policy Implications

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The views expressed within this chapter are those of the author and should not be treated as Government policy.

1.1 Introduction

The Government recently published *New Industry, New Jobs* (BERR, 2009) setting out an innovative vision of the future of industrial policy. It is important to extend the evidence base which can be drawn upon in developing this approach in detail. In this context, British economic history is an important source especially with regard to the lessons that can be taken from the experience of successful sectors but also, more generally, in terms of learning from earlier vintages of industrial policy in Britain.

The strategy outlined in *New Industry, New Jobs* has three strands. First, that some aspects of horizontal (i.e., not sector-specific) policies will be strengthened. Second, the Government will pursue selective initiatives at the sectoral level where policy intervention can make a positive difference. Third, Government will seek to use its role as a regulator and a customer to better effect, recognizing that in some sectors this can have a major impact on investment and innovation. A key point here is to recognize heterogeneity; Government policy needs to be sensitive to this in terms both of the scope for selective intervention and of the differential impact across sectors of horizontal policies.

At the same time, it is emphasized that there is no intention to turn back to policies of nationalization, protectionism or promoting 'national champions'. This was the approach of the 1960s and 1970s which got 'industrial policy' a bad name. Commentators who were by no means against Government intervention in principle concluded that policy appeared to be directed at helping old industries to survive rather than encouraging new products and new technology" (Silberston, 1981, p. 49) and that, although 'picking winners' may have been the aspiration, "it was losers like Rolls Royce, British Leyland and Alfred Herbert who picked Ministers" (Morris and Stout, 1985, p. 873).

Since the 1970s, there have been a number of developments in economics that both call for a broader and more sophisticated approach to industrial policy than was then attempted and also identify more ways in which Government might make a significant difference to growth, productivity and trade outcomes. In particular, the so-called new growth economics (Aghion and Howitt, 2006), new international economics (Richardson, 1989) and new economic geography (Baldwin et al., 2003) can all be drawn upon to this effect. While insights from these approaches can be

used to strengthen ‘market-failure’ reasons for policy interventions, at the same time, they also underline reasons to worry about ‘Government failure’ and indicate that policy errors will be more expensive than hitherto expected.

This paper examines the ideas put forward in *New Industry, New Jobs* in the context both of these developments in the economics of industrial policy and of postwar British economic history. With this background, the set of case studies recently commissioned by BIS will be analyzed. The aim is to address the following linked questions:

- what lessons can be learnt from past experience of industrial policies (both horizontal and selective)?
- were there common factors in success?
- what accounts for differences in policy effectiveness across these sectors?
- what sectoral characteristics matter for policy design?
- what lessons are relevant for other sectors?

1.2 New Industry, New Jobs

This section sets out in more detail some key points from this policy document which can be developed further with reference to the economics of industrial policy in section 1.3 and will be useful to bear in mind when considering the historical experience in sections 1.4 and 1.5. Numbers in parentheses refer to paragraphs in *New Industry, New Jobs*.

My understanding is that NINJ argues that there is good reason to develop a somewhat more pro-active industrial policy. Well-targeted Government intervention is needed to improve economic efficiency. This will comprise not only a strengthening of general policies to promote competitiveness but also greater sector-specific activism to address market failures. An important role is envisaged for Government as a purchaser and regulator rather than just a provider of subsidies. Since the Government has a pervasive presence in the economic environment of business, it should be more aware of the implications of its actions for the prospects of successful development of sectors which have the potential to grow and create employment. Interventions should be expected to show results in terms of improved productivity performance, good jobs, or technological spillovers (5.6).

More specifically:

- General competitiveness policies will be adapted and strengthened, especially in the priority areas of finance, infrastructure, innovation and skills (2.17, 3.3).
- Government can shape long-term investment decisions by sending clear and credible signals of its strategy in particular in terms of greater regulatory certainty and smarter procurement that takes account of supply-chain implications and drives demand for new technologies and new skills (4.2, 4.15, 4.20).
- Selective interventions will be made where Government can make a difference. This entails working with markets and tailoring policies to fit specific circumstances to provide a source of competitive advantage (4.1, 5.2, 5.4).

- This does not entail raising trade barriers or diluting competition policy and does not mean returning to greater state ownership or trying to pick winners (4.3, 6.5).
- Interventions need to be justified in terms of value for money, i.e., be justifiable in terms of social cost-benefit analysis (5.6)

Overall, this amounts to a re-balancing of Government supply side policy by strengthening its industrial component while continuing to recognize the importance of competition, by increasing the use of selective interventions while still pursuing horizontal policies, and by placing greater weight on promoting change through procurement and regulation rather than subsidies.

1.3 The Economics of Industrial Policy

'Industrial policy' is perhaps best defined in the manner of Caves (1987) to encompass public sector intervention aimed at changing the distribution of resources across economic sectors and activities. Thus, industrial policy includes both 'horizontal' policies which focus on activities such as innovation, provision of infrastructure etc. while 'selective' policies aim to increase the size of particular sectors. The classic justification for industrial policy is that it remedies market failures, for example, by providing public goods or subsidizing activities with positive externalities. Thus, in the case of innovation there is good reason to believe that the social rate exceeds the private rate of return to Research and Development (R & D) (Jones and Williams, 1998) and that reliance on the market alone will mean that there is too little R & D. Of course, since research intensity varies across industries, horizontal policies to encourage R & D will help some sectors more than others.

More generally, the development of endogenous-growth theory suggests that policies which raise the appropriable rate of return to innovation and/or investment can have positive effects on the rate of growth. Quite a wide range of Government policies might be relevant here including the structure of taxation, the quality of state education, the supply of infrastructure capital which raises private sector profitability etc.¹ Reduction of regulatory risk and Government procurement contracts can also perform a similar function, as highlighted by *New Industry, New Jobs*.

The case for selective industrial policies has always been more controversial. However, the modern literature highlights three arguments in their favour, namely, arguments based on infant-industry related capital market failures, agglomeration externalities, and rent-switching under imperfect competition. At the same time, a number of pitfalls in the use of such policies have been noted.

'Infant industry' arguments are, of course, not new but they have been reworked in recent times notably by Bardhan (1971) and Young (1991). The case is for temporary protection of industries which are not currently internationally competitive but will be

¹ It is important to remember that the supply of public capital has to be financed and that the taxes that are levied to this end tend to have offsetting effects on private rates of return. For a discussion of the growth-maximizing ratio of public to private capital, see Kamps (2005).

when productivity has improved through increasing returns and, in particular, learning by doing. The case for intervention really depends on the capital market's inability to finance these activities even though they will become privately profitable, perhaps because the learning effects accrue to the industry as a whole rather than being firm-specific. A key issue is whether the Government can credibly commit to the policy intervention being temporary.

The advent of the new economic geography has increased awareness of the potential importance of agglomeration benefits which accrue when economic activity is characterized by scale economies together with market size effects. As city size increases productivity gains can be realized through knowledge spillovers, better availability of intermediate inputs and the advantages of a deeper labour pool. Policy interventions may then be justified on the grounds of spatial externalities which are now recognized by the Department for Transport (2006) as an example of the 'wider economic benefits' that can result from transport projects. In cases where size matters, there may be gains from policy interventions that facilitate the expansion of an agglomeration or, indeed, the establishment of a successful cluster which obtains first-mover advantages.

The rent-switching argument for industrial policy came to prominence in the 1980s through the work of Brander and Spencer (1985). The argument here is that in cases of strategic rivalry in international trade the state can influence entry and exit decisions by offering subsidies that result in higher market share for its firm at the expense of a foreign rival and redistributes super-normal profits accordingly.² Because Government values objectives other than private profits it may be able credibly to commit to finance entry where capital markets cannot. Whether such interventions will succeed may be hard to predict, however, and where their size and/or timing turn out to be inappropriate they may be expensive failures.

It should also be acknowledged that there are important potential downsides to the use of selective industrial policy. In particular, it has been widely remarked that, in practice, support is disproportionately given to sunset rather than sunrise industries and some economists argue that this 'Government failure' is an inherent aspect of the political economy of industrial policy. Recently, Baldwin and Robert-Nicoud (2007) have used a variant of the well-known 'protection-for-sale' model to argue that the asymmetric appropriability of rents implies that losers lobby harder while earlier explanations include the 'social insurance' explanation of Hillman (1989) and the suggestion by Krueger (1990) that known losers in ailing industries are more visible than unknown gainers in expanding industries.

Another problem is that industrial policy may cushion sleepy management by providing cash flow which delays the need to take action to eliminate organizational slack or to innovate. Clearly, this analysis has relevance where firms are exposed to principal-agent problems which allow scope for inefficient management to persist. The classic antidote to this is to strengthen competition rather than industrial policy (Aghion et al., 1997).

2 Subject to compliance with WTO rules.

Finally, it should also be noted that insofar as industrial policy works through protection of domestic producers some of the potential gains from trade are given up. Traditionally, these were thought of as the 'welfare-triangle' costs of elementary international economics but now losses from forgone scale economies and productive inefficiency are seen as more important with the implication that welfare losses from departing from free trade are typically expected to be considerably larger as is suggested by the influential analysis of Frankel and Romer (1999)³.

1.4 Industrial Policy in Postwar Britain

Industrial policy has evolved considerably during the postwar period. The 1960s and 1970s were the high point of activism and especially of selective interventions. Since then, this stance has been superseded by a period of greater emphasis on promoting competition while industrial policy has been directed to general competitiveness and, notably, support for innovation. This section provides a selective review of this history. The examples are chosen with a view to highlighting some key arguments in *New Industry, New Jobs*.

Three important points deserve to be highlighted from the heyday of industrial policy prior to 1980. First, this period was characterized by a very strong emphasis on investment subsidies, amounting to about 10 per cent of fixed investment at their peak in 1978 (Driver and Temple, 1999). These are widely thought to have represented very poor value for money and to have been an ill-conceived policy. The econometric evidence is that they had little effect on the volume of investment over the long run (Sumner, 1999) with the implication that there was a large deadweight cost of subsidizing expenditures that would have happened anyway. And it is now generally accepted that there is no general tendency for the social rate to exceed the private rate of return to physical capital formation (Oulton and Young, 1996) so that the market-failure justification for this intervention is questionable.

Second, there is a very clear tendency for selective subsidies to be skewed towards relatively few industries, notably aircraft, shipbuilding and, latterly, motor vehicles (Wren, 1996a). The bias towards shipbuilding is striking since this was clearly an industry in which the UK no longer had a comparative advantage in the face of Asian competition. More generally, there is quite a strong bias towards shoring up ailing industries which is well reflected in the portfolio of holdings of the National Enterprise Board (Wren, 1996b), in the pattern of tariff protection across sectors (Greenway and Milner, 1994), and also in the nationalizations of the 1970s where the prevalence of very poor rates of return reflected a lack of political will to eliminate productive inefficiency (Vickers and Yarrow, 1988).

Third, policies to subsidize British high-technology industries with a view to increasing world market share in sectors where supernormal profits might be obtained were notably unsuccessful in this period in a number of cases including civil aircraft (Gardner, 1976), computers (Hendry, 1989) and nuclear power (Cowan, 1990). A combination of subsidies to American producers linked to defence spending and the relatively small size of the British market undermined these attempts at rent-switching.

3 These estimates were the basis of the assessment by HM Treasury (2003) of the gains from lower trade costs if the UK joined the Euro.

From the post-1980 period, there are also important lessons to be learnt. First, there is good reason to believe that the increased emphasis on competition rather than industrial policy to promote productivity growth was justified. For example, Haskel (1991) found that increases in competition were important in the improved productivity performance of the 1980s. Perhaps more significantly, given the prevalence in the UK of firms with a separation of ownership and control, Nickell et al. (1997) found that for companies without a dominant external shareholder a fall in supernormal profits from 15 to 5 per cent of value added raised TFP growth by 1 percentage point per year.

Second, it is clear that there have been substantial effects of regulation on the diffusion of new technology in the context of the ICT revolution. The UK has been in a more favourable position than most of its European rivals and accordingly has had a greater contribution of ICT-using services to productivity growth and has seen ICT capital per worker increase more rapidly (van Ark et al., 2008). The UK's advantages come from a flexible labour market which has facilitated productivity gains from the reorganization of work (Gust and Marquez, 2004) and from relatively low levels of product market regulation (Nicoletti and Scarpetta, 2005) which have allowed greater flexibility in sectors like retailing. Regulation has made a big (but unintentional) difference.

Third, it is quite clear that long-run investments with a high sunk cost component are very sensitive to the incentives resulting from regulation and commitment (or lack of it) by Government to clear strategic plans. Helm (2009) stresses that while the privatized utilities were strongly incentivized to address operating costs, the major investment programme that is now required for energy infrastructure capital has been impaired by weaknesses in regulatory design and Government reluctance to provide clear guidance and guarantees to underpin decisions about the capacity mix.

These examples tend to support several of the major planks of the stance adopted in *New Industry, New Jobs*. In particular, it would not seem wise to return to 1970s policies of state ownership and picking winners or to undermine competition policy. It is also clear that some interventions have in the past been ineffective and a value for money test is certainly appropriate where activist policies are contemplated. Finally, it is important to recognize that some of the significant impacts that Government has on investment and innovation come through policy frameworks which are quite dissimilar to those which are traditionally thought of as 'industrial policy', such as regulation and planning decisions.

1.5 Key Points from the Case Studies of Britain's Successful Sectors

This section highlights important points in the individual historical case studies and relates them to the general theoretical and historical context already established. Obviously, the treatment of each sector will be quite selective and there is no intention of trying to provide a full summary of the material contained in these papers.

TEXTILES (LEUNIG AND TENNENT, 2010)

Textiles, especially cottons, were the pre-eminent British success story of the Industrial Revolution. The policy framework which facilitated the sector's expansion and longevity was characterized in particular by openness and the freedom from planning restrictions which allowed the rapid expansion of urban areas in the North of England and underwrote the development of hugely successful agglomerations (Leunig and Overman, 2008). Strong productivity advantages of agglomeration allowed survival in the face of low-wage competition from Asia for a surprisingly long time but not indefinitely. The British textiles industry invented very successful manmade fibres like polyester and in the postwar period featured famous companies like Courtaulds and ICI but, in an open economy, was on an unstoppable trajectory of decline which is reflected in its weak position with regard to revealed comparative advantage (RCA), as is reported in Table 1.1.

Table 1.1: Revealed Comparative Advantage in UK Manufacturing

Revealed Comparative Advantage in UK Manufacturing	1970-74	1980-84	1990-93	2006
Food, Drink & Tobacco	0.71	0.87	0.93	0.79
Textiles, Footwear & Leather	0.93	0.84	0.79	0.47
Wood, Cork & Furniture	0.22	0.32	0.29	0.39
Paper, Print & Publishing	0.54	0.62	0.80	1.15
Industrial Chemicals	0.96	1.16	1.17	1.13
Pharmaceuticals	1.46	1.54	1.61	2.11
Petroleum Refining	1.10	1.27	1.36	0.79
Rubber & Plastic Products	0.96	1.02	0.95	0.82
Stone, Clay & Glass	0.98	0.84	0.81	0.75
Ferrous Metals	0.58	0.51	0.89	0.69
Non-Ferrous Metals	1.27	1.21	0.98	0.79
Fabricated Metal Products	1.12	0.96	0.82	0.81
Non-Electrical Machinery	1.12	1.12	0.93	1.33
Computers & Office Machinery	1.08	1.19	1.53	1.03
Electrical Machinery	1.03	0.99	0.84	0.60
Communication Equipment	0.72	0.72	1.02	2.52
Shipbuilding	0.59	0.52	0.94	0.34
Other Transport Equipment	0.72	0.61	0.40	0.36
Motor Vehicles	0.94	0.62	0.67	0.94
Aerospace	1.49	1.98	1.63	1.72
Instruments	1.00	1.15	1.07	1.23
Other Manufacturing	2.48	1.93	1.57	1.26

Note: normalized so that mean RCA in manufacturing = 1.

Source: Proudman & Redding (2000) with 2006 added using ITC data.

Like other losers, the cotton industry lobbied Government. Selective interventions were made on its behalf starting with the 1959 Cotton Industry Act. The general thrust was to subsidize rationalization of capacity and to promote mergers. Ex post, this turned out to be a futile use of industrial policy. Ex ante, this was highly predictable. The good news is that the cotton industry received relatively little help compared with other lost causes such as shipbuilding (Singleton, 1991). The lesson is that in previously-successful sectors where comparative advantage has been irrevocably lost there is no hope of making a difference and there will not be a benefit-cost based case for intervention.

AEROSPACE (HARTLEY, 2010)

Aerospace is a manufacturing sector in which the UK continues to have considerable success and a strong RCA score (Table 1.1). This reflects continuing strength in military aircraft and aircraft components but the UK has discontinued the development and production of civil aircraft after a long history of Government subsidies for the activity, notably through launch aid. The aerospace sector is human capital and R & D intensive and is not vulnerable to low-wage competition from abroad but economies of scale mean that a large domestic market is, in practice, a massive advantage.

These characteristics of the industry suggest that there might be scope for the use of strategic trade policy to redistribute supernormal profits and it has been the cause celebre in the literature. It might be thought that this was a rationale for British subsidies to civil aircraft but in the event these were unsuccessful perhaps because the British market was too small. A European-level policy, Airbus, does however, appear to have been a successful example of a rent-switching industrial policy (which has provided opportunities for British wing designers and producers). Neven and Seabright (1995) estimated that Airbus was likely to produce an acceptable rate of return for Europe over fifty years while at the same time reducing Boeing's profits significantly and cutting world-wide aircraft prices a bit.⁴

The size and structure of the defence-aircraft industry is entirely dependent on Government policy. Given the size of the sunk costs and the scope for opportunistic behaviour, private finance of military aircraft projects is not feasible so producers rely on Government contracts. This implies that an absolutely central issue is the design of procurement contracts where neither fixed price nor cost plus will be appropriate but some kind of risk sharing that achieves a reasonable balance between incentivizing cost control and imposing too much (costly) risk on the (risk-averse) supplier. The role of the Government as smart purchaser is key but this has clearly been problematic historically.

A major unresolved issue in this sector is whether selective assistance has been worthwhile. Recent reviews seem to come to inconclusive results just as did the Plowden Review (1965). The general economic argument in favour of subsidizing R & D in the aircraft industry is presumably this has a high social rate of return including through technological spillovers. Yet, demonstrating this seems quite elusive.

⁴ The modelling exercise in Neven and Seabright (1995) is complicated by the presence of McDonnell Douglas. In that firm's absence the value of the Airbus subsidies policy is potentially greater especially in holding down aircraft prices.

PHARMACEUTICALS (OWEN, 2010)

Pharmaceuticals is a sector in which the UK's competitive position has strengthened remarkably since the early postwar period when it ranked below the median in terms of RCA in manufacturing (Balassa, 1977). It is generally agreed that this is a sector for which Government policy has been instrumental in underpinning success but it is less clear what have been the relative contributions of different aspects of that policy.

One major impact of Government may have been through the demand side and the drug-purchasing policies of the NHS. The Pharmaceutical Price Regulation Scheme (PPRS) has shaped the incentives facing pharmaceutical companies. It is suggested by some that over time this acted as a successful industrial policy which provided a distinctive form of rate of return regulation which could be used by the Department of Health to encourage R & D in the UK (Thomas, 1994). This would seem to exemplify the role for Government as a smart purchaser envisaged by *New Industry, New Jobs*. Moreover, given that the industry has earned significant rents on its exports (Garau and Sussex, 2007), this might also be seen as an example of success with strategic trade policy.

Other writers are sceptical of this view noting that the UK is a small part of the world market (around 4 per cent) and arguing that the quality of the science base is by far the most important factor in location decisions for pharmaceutical R & D (NERA, 2007). From this perspective, the most important aspect of Government support for the industry has been the provision of elite research universities with world-class departments in the key sciences together with public funding for research through the National Institute for Health Research and Research Councils, notably the Medical Research Council and the Biotechnology and Biological Sciences Research Council. This was the view taken by OFT (2007) in its report which argued for the end of the PPRS.

The major lesson that could be learned from this case study is the importance of a stable business environment with reliable supporting institutions.

This is supported by the recent BIS Economics Paper *Life Sciences in the UK* which concluded that the UK's significant comparative advantage in Life sciences stems from a number of sources, including a high quality science base, well established property rights system and a growing reputation for strong networking and collaboration between firms in the industry and with public research institutes both nationally and internationally.

FINANCIAL SERVICES (MICHIE, 2010)

Financial services is a sector that has grown very rapidly since the mid-1980s doubling its share of GDP from 4 to 8 per cent and having a very high RCA score of 5.05 in 2006. It is a sector in which external economies of scale matter and its productivity has a relative large agglomeration elasticity (Graham, 2007a). The sources of these agglomeration benefits tend to be stronger for front-office functions and include the size of the labour pool and the quality of the financial infrastructure (OXERA, 2005). The proximity of individuals is important in activities which are best carried out on a face-to-face basis and the historical basis for the pre-eminence of the

‘square mile’ was quality of its information which derived from first-mover advantages (Cochrane, 2009).

The financial services sector in London continues to enjoy agglomeration advantages which have underpinned its position against the challenge of smaller rival centres. That said, in the 1970s, this was by no means certain to be the case as London was constrained by regulation, restrictions on building and exchange controls. To exploit the opportunities provided by the globalization of capital markets following the end of the Bretton-Woods era, London attracted a major inflow of foreign banks and human capital. Reductions in taxation and de-regulation in the 1980s were important policy changes that promoted these developments together with relaxation of planning controls as Canary Wharf was developed and the City strove to sustain its position in the face of this competition. This was reflected in a big fall in the ‘regulatory tax’ on office space in the City after the 1970s (Cheshire and Hilber, 2008).⁵

To sustain agglomeration advantages, size matters. This brings out the importance of two aspects of Government policy, namely, financial regulation and the provision of transport infrastructure. Financial regulation is clearly a crucial aspect of policy for this sector as has been apparent in the past in the context of switching of activity between New York and London. Regulation of the banking system is important because, in a world of asymmetric information, market failures leading to excessive risk taking are a real danger. At the same time, given that the financial services are potentially internationally mobile if the stringency of regulation outweighs the benefits of agglomeration, regulatory competition is an issue and in the recent past regulation ‘with a light touch’ has recognized this.

Transport infrastructure is also a key to the size of the financial cluster because London’s labour pool is based on commuting. This is reflected, for example, in the estimated benefits from Crossrail where agglomeration benefits accruing in financial services are a significant part of the wider economic benefits predicted from the transport improvement (Department for Transport, 2006).

CREATIVE INDUSTRIES (BAKKER, 2010)

This paper considers three sub-divisions of the creative-industry sector, namely, film, music, and videogames, each with rather different histories of Government involvement. The common feature of media services (SIC 921, 922) is that they exhibit strong productivity-increasing agglomeration externalities of a similar magnitude to those in financial services (Graham, 2007b). Both film and music have been spatially concentrated in the London area. The importance of agglomeration seems to reside in a combination of knowledge spillovers, both within and across sectors, and the availability of specialized inputs, for example, the film and music industries use specialized finance and legal services.

5 The ‘regulatory tax’ concept used by Cheshire and Hilber (2008) is based on a comparison of market valuations of office space compared with the marginal costs of construction.

The film industry in Britain has depended heavily on selective interventions to protect a share of the home market for UK-based film production. This policy goes back to the 1920s and has used different policy instruments over time, including quotas, levies and tax credits. The policy succeeded in bringing foreign direct investment (FDI) by American producers into the UK and has led to balance of payments surpluses in films. Neither music nor videogames has seen anything similar. Instead, the music industry seems to have benefited from the availability of education and from the provision of facilities such as concert halls and the establishment of events like music festivals. This long-standing cultural heritage has fostered the development of high-quality human capital which is a key ingredient for success. Videogames can be seen as a sector which has grown spontaneously using science graduates that the industry trains in-house.

The most obvious role for Government with regard to the creative-industries sector is in providing appropriate educational opportunities. However, given the importance of external economies of scale and the key role that the London agglomeration plays in the creative-industries sector, the aspects of policy that matter here also include provision of transport infrastructure and planning rules that influence city size and location decisions.

1.6 Lessons from Successful Sectors

The overall impression given by the case studies with regard to experience in the use of industrial policies is that they bear out the general messages of earlier sections of the paper. In particular, there is a relatively small role for selective industrial subsidies and that the sectors that were keenest on those subsidies, civil aircraft and textiles, were losers. On the other hand, general competitiveness policies have certainly had important effects, notably, through the availability of human capital and the provision of infrastructure to underpin agglomerations rather than through investment subsidies. Also, it is clear that regulation can be important – the UK's regulatory stance was key to the growth of the City from the 1980s.

The most obvious common factor in success is the importance of human capital both in terms of the factor intensities of the sectors and the availability of the relevant expertise in the UK. Aerospace, pharmaceuticals, financial services, and creative industries all can be described as intensive in the use of high-skilled labour. By contrast, textiles is a low-skilled sector and therefore much more vulnerable to low-wage competition. The estimates of RCA reported in Tables 1.1 and 1.2 reflect similar trends.

Table 1.2: Revealed Comparative Advantage in Non- Manufacturing, 2006

Revealed Comparative Advantage in Non-Manufacturing, 2006	
Transport	1.05
Travel	0.97
Communications	2.21
Construction	0.50
Insurance	2.55
Financial Services	5.05
Computer and Information Services	1.86
Royalties and Licence Fees	1.06
Other Business Services	2.14
Personal, Cultural and recreational Services	2.39
Government Services n.i.e.	1.24

Note: unlike Table 1.1 these numbers are not normalized

Source: UNCTAD Services Trade database

Policy effectiveness clearly varied greatly across these sectors. In textiles, the attempts at intervention made in the 1950s and 1960s were unsuccessful. This was a highly successful industry whose time had gone in the sense that it was no longer internationally competitive and protection of the industry could only imply welfare losses for British consumers that would easily outweigh any gains for producers. At the other end of the spectrum, in pharmaceuticals the UK developed a strong comparative advantage based on Government support for the science base and inducements to carry out R & D. This was an activity well-suited to British factor endowments. Financial services benefited from the policy climate of the 1980s which favoured globalization, reductions in direct taxes and de-regulation but these policies were effective because there was already a successful agglomeration on which to build. In the aircraft industry, measured in terms of sustaining an internationally competitive presence, there were both failures (civil) and successes (military) for the extensive and pivotal policy interventions that were so frequent. The effectiveness of policy is still open to question in the sense that it is not at all clear what a full cost-benefit analysis would show. In the creative industries, there was little overt policy involvement except in film where protection succeeded in allowing UK-based production to survive.

Theory suggests some sectoral characteristics that should matter for the design of policy. The case studies illustrate some of these points. First, it is worth considering whether capital-market failures are to be expected and, if so, why? For example, there are overwhelming reasons to expect this for military aircraft but not necessarily for civil aircraft. The *prima facie* case for intervention is much stronger for the former. Second, it is important to know whether there are economies of scale and, if so, over what range of production. This might be a key piece of information in evaluating the prospects for surviving in competition and attempting to use strategic trade policy with the United States, especially in activities where learning matters. Third, especially in a services-orientated economy, it is important to take account of the role

of, and basis for, agglomeration externalities which can be affected by a wide range of Government policies including planning and transport, as is strongly suggested both by the financial services and the creative industries papers. Fourth, it is worth asking whether it is plausible that the sector can be internationally competitive taking into account its factor intensities and innovation trajectory? The temptation here is clearly to optimism bias as the textiles case underlines.

Finally, these case studies suggest some lessons of relevance for policy more generally in the context of the economic rationale for industrial policy, as follows:

- There are grounds for arguing that strategic trade policy can work and that Government subsidies may be able to divert supernormal profits to home producers. However, the aircraft industry experience suggests that this is high-risk;
- There is substance in the new economic geography argument that agglomerations matter for productivity performance. This is particularly evident in service sectors and is borne out by the experiences of financial services and the creative industries. This implies that a wide range of policies that affect the sustainability of agglomerations through addressing rising 'congestion' costs are relevant;
- General competitiveness policies have mattered more than selective subsidies for successful sectors. The supply of skills and expertise is highly relevant in every case. The availability of human capital is greatly affected by Government policy and raises the returns to investing in the UK; a very obvious success story that highlights this is pharmaceuticals.

1.7 References

- Aghion, P. and Howitt, P. (2006), "Appropriate Growth Policy: a Unifying Framework", *Journal of the European Economic Association*, 4, 269-314.
- Aghion, P., Dewatripont, M. and Rey, P. (1997), "Corporate Governance, Competition Policy and Industrial Policy", *European Economic Review*, 41, 797-805.
- Balassa, B. (1977), "'Revealed' Comparative Advantage Revisited: an Analysis of Relative Export Shares of the Industrial Countries, 1953-1971", *Manchester School*, 45, 327-344.
- Baldwin, R. E. and Robert-Nicoud, F. (2007), "Entry and Asymmetric Lobbying: Why Governments Pick Losers", *Journal of the European Economic Association*, 5, 1064-1093.
- Baldwin, R. E., Forslid, R. Martin, P., Ottaviano, G. and Robert-Nicoud, F. (2003), *Economic Geography and Public Policy*. Princeton: Princeton University Press.
- Bardhan, P. (1971), "On the Optimum Subsidy to a Learning Industry: an Aspect of the Theory of Infant-Industry Protection", *International Economic Review*, 12, 54-70.
- BERR (2009), *New Industry, New Jobs*. London.
- BIS (2010), BIS Economics Paper No. 2 Life Sciences in the UK – Economic analysis and evidence for 'Life Sciences 2010: Delivering the Blueprint' London
- Bloom, N. and van Reenen, J. (1998), "Regulating Drug Prices: Where Do We Go from Here?", *Fiscal Studies*, 19, 321-342.
- Brander, J. A. and Spencer, B. J. (1985), "Export Subsidies and International Market Share Rivalry", *Journal of International Economics*, 18, 83-100.
- Caves, R. E. (1987), "Industrial Policy and Trade Policy: the Connections", in H. Kierzkowski (ed.), *Protection and Competition in International Trade: Essays in Honour of W. M. Corden*. Oxford: Blackwell.
- Cheshire, P. C. and Hilber, C. A. L. (2008), "Office Space Supply Restrictions in Britain: the Political Economy of Market Revenge", *Economic Journal*, 118, F185-F221.
- Cmnd. 2853 (1965), *Report of the Committee of Inquiry into the Aircraft Industry*. London: HMSO.
- Cochrane, S. (2009), "Explaining London's Dominance in International Financial Services, 1870-1913", University of Oxford Department of Economics Discussion Paper No. 455.
- Cowan, R. (1990), "Nuclear Power Reactors: a Study in Technological Lock-In", *Journal of Economic History*, 50, 541-567.

Department for Transport (2006), *Transport, Wider Economic Benefits and Impacts on GDP*. London.

Driver, C. and Temple, P. (1999), "Overview: a Survey of Key Policy Issues", in C. Driver and P. Temple (eds.), *Investment, Growth and Employment*. London: Routledge, 251- 265.

Frankel, J. and Romer, D. (1999), "Does Trade Cause Growth?", *American Economic Review*, 89, 379-399.

Garau, M. and Sussex, J. (2007), *Estimating Pharmaceutical Companies' Value to the National Economy*. London: Office of Health Economics

Gardner, N. (1976), "The Economics of Launching Aid", in A. Whiting (ed.), *The Economics of Industrial Subsidies*. London: HMSO, 141-155.

Graham, D. (2007a), "Variable Returns to Agglomeration and the Effect of Road Traffic Congestion", *Journal of Urban Economics*, 62, 103-120.

Graham, D. (2007b), "Identifying Urbanization and Localization Externalities in Manufacturing and Service Industries", *Papers in Regional Science*,

Greenaway, D. and Milner, C. (1994), "Determinants of the Inter-Industry Structure of Protection in the UK", *Oxford Bulletin of Economics and Statistics*, 56, 399-419.

Gust, C. and Marquez, J. (2004), "International Comparisons of Productivity Growth: the Role of Information Technology and Regulatory Practices", *Labour Economics*, 11, 33-58.

Haskel, J. (1991), "Imperfect Competition, Work Practices and Productivity Growth", *Oxford Bulletin of Economics and Statistics*, 53, 265-279.

Helm, D. (2009), "Infrastructure Investment, the Costs of Capital, and Regulation: an Assessment", *Oxford Review of Economic Policy*, 25, 307-326.

Hendry, J. (1989), *Innovating for Failure: Government Policy and the Early British Computer Industry*. London: MIT Press.

Hillman, A. (1989), *The Political Economy of Protection*. New York: Harwood Academic Publishers.

HM Treasury (2003), *UK Membership of the Single Currency: an Assessment of the Five Economic Tests*. London.

Jones, C. I. and Williams, J. C. (1998), "Measuring the Social Return to R & D", *Quarterly Journal of Economics*, 113, 1120-1135.

Kamps, C. "Is There a Lack of Public Capital in the European Union?", *EIB Papers*, 10(1), 73-93.

- Krueger, A. (1990), "Asymmetries in Policy between Exportables and Import-Competing Goods", in R. Jones and A. Krueger (eds.), *The Political Economy of International Trade*. Oxford: Blackwell.
- Leunig, T. and Overman, H. (2008), "Spatial Patterns of Development and the British Housing Market", *Oxford Review of Economic Policy*, 24, 59-78.
- Morris, D. J. and Stout, D. (1985), "Industrial Policy", in D. J. Morris (ed.), *The Economic System in the UK*. Oxford: Oxford University Press, 851-894.
- NERA (2007), *Key Factors in Attracting Internationally-Mobile Investments by the Research-Based Pharmaceutical Industry*. London.
- Neven, D. and Seabright, P. (1995), "European Industrial Policy: the Airbus Case", *Economic Policy*, 21, 313-358.
- Nicoletti, G. and Scarpetta, S. (2005), "Regulation and Economic Performance: Product Market Reforms and Productivity in the OECD",
OECD Economics Department Working Paper No. 460.
- Nickell, S., Nicolitsas, D. and Dryden, N. (1997), "What Makes Firms Perform Well?", *European Economic Review*, 41, 783-796.
- Office of Fair Trading (2007), *The Pharmaceutical Price Regulation Scheme*. London.
- Oulton, N. and Young, G. (1996), "How High is the Social Rate of Return to Investment?", *Oxford Review of Economic Policy*, 12(2), 48-69.
- OXERA (2005), *The Future of UK Asset Management: Competitive Position and Location Choice*. Oxford.
- Proudman, J. and Redding, S. (2000), "Evolving Patterns of International Trade", *Review of International Economics*, 8, 373-396.
- Richardson, J. D. (1989), "Empirical Research on Trade Liberalization with Imperfect Competition", *OECD Economic Studies*, 12, 7-50.
- Silberston, A. (1981), "Industrial Policies in Britain, 1960-1980", in C. Carter (ed.), *Industrial Policy and Innovation*. London: Heinemann, 39-51.
- Singleton, J. (1991), *Lancashire on the Scrapheap: the Cotton Industry, 1945-1970*. Oxford: Oxford University Press.
- Sumner, M. (1999), "Long-Run Effects of Investment Incentive", in C. Driver and P. Temple (eds.), *Investment, Growth and Employment: Perspectives for Policy*. London: Routledge, 292-300.

Thomas, L.G. (1994), "Implicit Industrial Policy: the Triumph of Britain and the Failure of France in Global Pharmaceuticals", *Industrial and Corporate Change*, 3, 451-489.

van Ark, B., O'Mahony, M. and Timmer, M. P. (2008), "The Productivity Gap between Europe and the United States: Trends and Causes", *Journal of Economic Perspectives*, 22, 25-44.

Vickers, J. and Yarrow, G. (1988), *Privatization: an Economic Analysis*. London: MIT Press.

Wren, C. (1996a), "Grant-Equivalent Expenditure on Industrial Subsidies in the Postwar United Kingdom", *Oxford Bulletin of Economics and Statistics*, 58, 317-353.

Wren, C. (1996b), *Industrial Subsidies: the UK Experience*. London: Macmillan.

Young, A. (1991), "Learning by Doing and the Dynamic Effects of International Trade", *Quarterly Journal of Economics*, 106, 369-405.

2. The Evolution of the British Entertainment Business: Film, Music and Videogames

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The views expressed within this chapter are those of the author and should not be taken as the view of BIS, DCMS or any other Government department.

This report analyses the evolution of the film, music and videogames industry. It finds that British firms were successful in all three industries, but that policy intervention differed substantially. It was large in film and far smaller in music and videogames. Britain's comparative advantage in these industries was at least partially due to their project-based nature, and their fit with the creative industries cluster as a whole as well as with the many other project-based industries in which Britain excels and which largely cluster in the London industrial district, such as finance, law and business services.

2.1 Introduction

Entertainment has been important in Britain's history. Since at least Shakespeare's times it has had a vibrant live entertainment industry, including theatre, music, opera, musicals and many other forms. While Britain could trade cotton, it could not trade live entertainment, as it had to be consumed at the place of production. Since the late 19th century, however, new technologies emerged that made entertainment tradable and that thus changed Britain's comparative advantages. Sometimes Britain was able to capitalise on its strength in creative industries, sometimes other countries, especially the US, forged ahead. The first technology, recorded sound, made music tradable. It was invented in 1877 and commercialised in the 1890s. The second technology, motion pictures, made theatrical entertainment tradable. It was invented in the 1890s and fully commercialised since the late 1900s. The third technology, microprocessor-based videogames, was commercialised in the early 1970s, and made playing experiences tradable and partially substituted tradable games such as board games.

Although none of these innovations were invented in Britain, Britain played an important part in providing content for them. In music it was a leading provider of content for the world market and spawned several large multinational firms that distributed the music world-wide. In film, despite several busts, it became the second-largest provider of global content after the United States, although attempts to found its own film multinationals proved elusive. In videogames, Britain became the world's third-largest provider of content, but again has not succeeded in spawning a global publisher distributor.⁶

6 Recently its place has slipped to being the 4th or 5th largest videogame developer.

This report aims to map the evolution of these creative industries in Britain, to assess the impact that policy has had on their development, and to estimate their impact on the economy. It will draw lessons regarding British strengths and weaknesses and potential implications for the approach towards industrial policy, regulation and competition policy.

This exercise is worthwhile because the creative industries as a whole comprise a substantial share of the economy (while film, music and videogames comprise a substantial of the creative industries), and because these activities show similarities to several other project-based industries in which Britain excels. Both these project-based industries as a class, and creative/entertainment industries within them, differ economically from many other more traditional industries in the primary and secondary sectors.

The three sub sectors also allow comparative insight into the key factors affecting their success: the film industry was characterised by a lot of direct policy intervention, the music industry by the absence of it, while the videogames sector is a new industry in which Britain excels.

The report is structured as follows. First, it will briefly outline the key economic characteristics of creative industries. Then it will analyse consecutively the emergence and development of the film, music and videogames industries in Britain. A comparative section will compare the experience of these industries and a final section will place them within the wider perspective of Britain's distinctive capability in project-based industries.

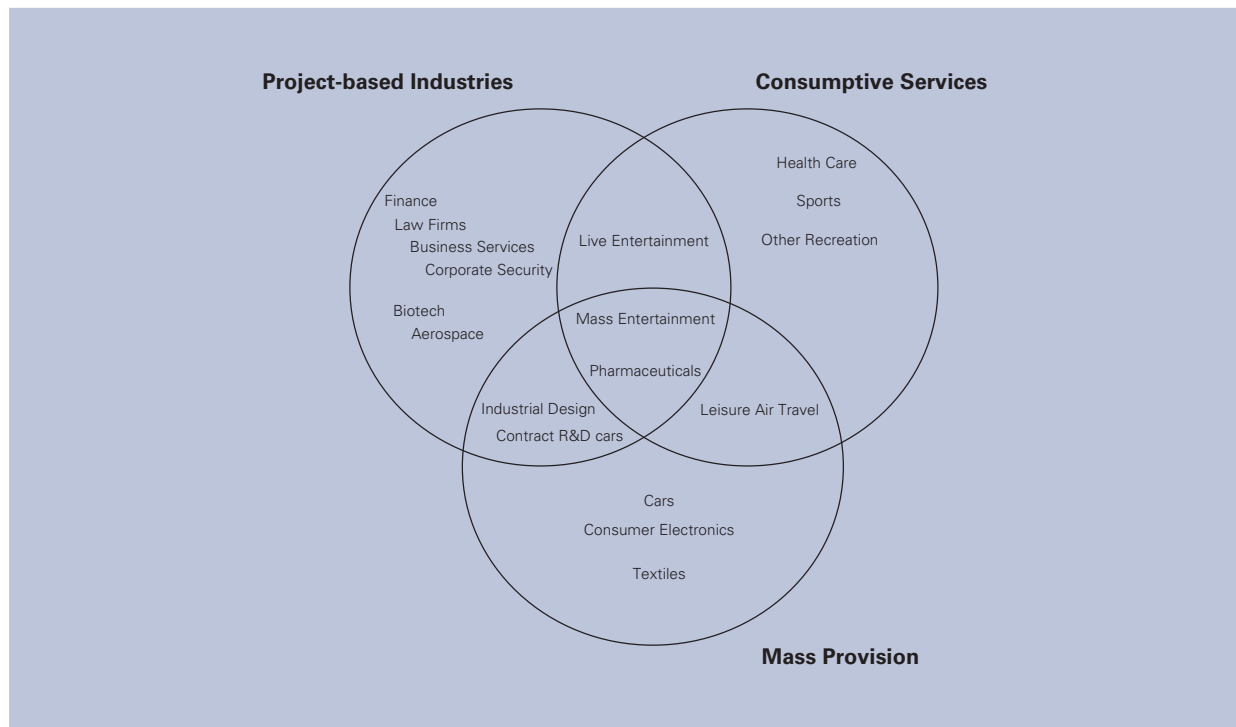
2.2 The creative industries

'Creative industries' is a term that can encompass many divergent industries.⁷ Here we limit ourselves to the entertainment industry, which is both a project-based industry and a consumptive service (Figure 2.1). The first is determined by the fact that industries are organised around projects, the second is defined by the third-person criterion (Reid 1934): if another person can do the service for you (such as with child care or cooking) then it is a productive service, even if it is performed by the household. If not (e.g. going to the dentist, listening to music, seeing a film), it is a consumptive service and part of household consumption.⁸

7 Many policy reports have been published on the contemporary creative industries as a whole. Given the degree of aggregation of these reports and the different (practical, policy) focus, these reports will not be discussed at length in the current report, which mainly focuses on the economic history of well-defined subsectors (film, music and videogames). Examples of recent policy reports include DCMS/The Work Foundation, *Staying Ahead: The economic performance of the UK's creative industries* (June 2007), and DCMS/BERR, *Creative Britain: New talents for the new economy* (2008). The current report aims to be complementary rather than replicate the many earlier reports.

8 Thus a journalist who is going to see a film to write a review is performing a productive service, as the newspaper can send somebody else in her place. The same journalist watching the same film in her leisure time is performing a consumptive service, as she can ask nobody else to do it for her.

Figure 2.1: Venn Diagram of the Mass Entertainment Industries in Taxonomic-Qualitatives Perspective



CHARACTERISTICS

Four other characteristics of the entertainment industry are that, first, up-front, 'sunk', costs are large and marginal costs are limited, making marginal revenues largely equal marginal gross profits. These sunk outlays are characterised by uncertain outcomes and substantial time lags before the money, if any, comes in.

Second, finance is a challenge because the costs are sunk and there is little tangible collateral.

Third, because of the endogenous sunk costs, potential market size drives the level of sunk outlays, i.e. 'prices drive costs', unlike many manufacturing industries where production costs co-determine price. Firms establish first what the size of the market is and what the various buyers are willing to pay, and then sink money into making it. A film company will generally not start production without a minimum guarantee of a distributor; a videogame developer will not start development without a contract with a game publisher-distributor.

Fourth, in the entertainment industry, outputs are provided in large portfolios of products with different content but a similar format, such as a feature film, a videogame or a 3-minute pop song. Distributors need a large portfolio of these products to utilise their capacity and to mitigate uncertainty for individual products.

SIGNIFICANCE

The entertainment industries examined here – the film, music and videogame industries, are important in themselves given their gross-output share in GDP, which was about 0.6 percent in 2008.⁹

Furthermore, these industries have three economic impacts worth highlighting; First of all, entertainment exports are distinctive in that very little physical product is exported. Royalty payments from abroad allow the UK to import more goods without having to export more physical goods. Individual successful titles can generate a substantial stream of royalty payments for a lengthy period of time. In the long-run this may lead to UK firms increasing the sunk outlays on new films, videogames and music, making the export impact smaller, but at the same time providing more jobs and buying more UK inputs.¹⁰

Secondly, many people involved in these entertainment industries work free lance and part time and have slack time. Foreign firms attracted to Britain to undertake creative production make direct use of British inputs and employ these free-lance individuals during slack times; in other words, these expenditures partially bring the economy closer to its potential output level.¹¹

A third aspect is that the entertainment industry has a welfare impact beyond its GDP-share. A key characteristic of entertainment is that 1) more so than other products, it costs time using it, and 2) this time is consumptive as it cannot be traded. Therefore the full cost to a consumer of entertainment is not only the price she needs to pay, but also the opportunity costs of her time.¹² This latter cost is best measured at the (marginal) wage rate, as entertainment time is generally free and flexible time, in which one could work as well.¹³ As the value of time spent consuming entertainment is a fully consumptive service, this is directly beneficial to consumer welfare.¹⁴

2.3 The evolution of the British film industry

THE INDUSTRY NOW AND THEN

In 2008, 202 film production companies were active. The two largest firms made four feature films each, the second five companies made three features each, the subsequent ten made two, and the remaining 185 enterprises made less than one feature film each.¹⁵ The total number of companies in film and video production was 7,970 (including specialised services companies) with a total employment of 21,113 full-time and part-time persons. A further 435 companies were active in film and video

9 See Table 2.12 for a breakdown and figures 2.5, 2.11, 2.12 & 2.15 for data sources.

10 The marketing expenditure for selling more rights overseas will of course also inflate in the long run, until the last pound spent on marketing equals the last pound received in royalties.

11 To the extent that those persons are working more and are more productive than in their next-best employment.

12 Goolsbee and Klenow (2006).

13 There's no such thing as a free evening – consumers are paying in their opportunity costs.

14 Compare this to a car, which is a means to go from a to b, and which can be substituted for a train, or a car-and-driver, and is only a final consumptive activity when one drives purely for fun.

15 The figure is less than one because some feature films have more companies associated with them, including special purpose vehicles of parent companies.

distribution, employing 2,751 persons, and 230 firms were exhibiting films, employing 11,551 persons. This gives a grand total of 8,635 firms employing 35,416 persons.

Cinema box office revenue was £850 million, UK rental and sales of films on DVDs and videocassettes £1,673 million, and the film revenues from the various UK television and video-on-demand outlets £1,187 million, making a total UK market size of £3,710 million of which 28 percent was attributable to UK films. Export and imports for 2007 (the latest year available), were £1,050 and £818 million, yielding a positive trade balance of £232 million, or 12 percent of all trade.¹⁶

In 1934, the first year for which exact figures are available, UK cinema expenditure was £2,090 million in today's money, showing a growth of the UK film market of 0.8 percent per year in real terms over the past 74 years, twice as fast as population growth. Per capita expenditure increased by a third: from £45 in 1934 to £60 nowadays. Four factors have shaped the evolution of the British film industry over the past century: technology, Government policy, the US film industry and the actions of several significant firms, interacting with the industry structure (Table 2.1). These factors will be discussed in turn.

Table 2.1: Key factors in the development of the British film industry, 1890-2000

	Technology	Industry structure	The U.S.	UK Policy
1890s	Emergence of cinema technology that makes entertainment tradable			
1900s	Fixed cinemas emerge			
1910s			Quality race started and won by some US firms	Entertainment Tax (1916-1960)
1920s	Coming of sound	Distribution becomes concentrated	Investment in UK production	Film Quota Act (1927), film quotas (1927-1985)
1930s	Coming of colour	J. Arthur Rank become dominant British firm Exhibition becomes concentrated		
1940s				U.S. remittances restricted (c. 1939-1947)
1950s	Suburbanisation, radio and TV redirect consumer time and money towards home entertainment		Investment in UK films (Eady fund and US tax advantages on foreign production)	Eady Levy National Film Finance Corporation
1960s				
1970s			Inward investment by US firms collapses as US tax advantages come into force (1969/1971 – 1976/1985)	Late 1970s: tax advantage for film financing (abolished in 1985)
1980s	Videocassettes Multiplexes (by new entrants)	Exhibition highly concentrated (MMC); followed by new entry		
1990s	DVDs			1992 and 1997 tax advantages for film finance
2000s	Internet downloads			New cultural test and production tax credit (2006 –)

16 All 2008 figures are taken from the UK Film Council's Statistical Year Book 2009.

TECHNOLOGY

The adoption of cinema technology itself in the 1890s was a major breakthrough, as it made live entertainment – a traditional British strength – tradable. The technology remained somewhat of a gadget, often used as a turn in music hall programmes until the mid-1900s, when an investment boom in fixed cinemas took off. Roughly ten years later, the feature film became the industry standard, a heavily marketed film with the length of a theatre play, with famous stars and based on a famous story. Cinema increasingly provided an alternative to theatre-going, and substitution jumped when talking pictures were adopted in Britain from 1928 onwards. Colour film became adopted during the late 1930s and 1940s. In the 1950s, however, new technologies moved against cinema. British families increasingly came to live in suburbs and preferred home entertainment to cinema, first in the form of radio, then as television. Cinema attendance declined, and only gradually did TV revenues compensate for lost box office revenues. This changed in the 1970s, when home video provided a major new income stream for Hollywood, replaced during the 1990s with DVDs and a proliferation of cable TV channels. The 1980s also saw the rise of the multiplex cinemas, which reversed the decline in cinema attendance by increasing consumer choice and reducing cinema average costs, by spreading fixed costs over more screens.

POLICY

Over the last century, Government policy affected the industry through various special tax policies, import quotas, exchange controls, direct subsidies and a collection of smaller policies (Table 2.1). These will be discussed in turn¹⁷.

Tariffs

In 1916 the Government introduced import tariffs on film, taxing exposed positive film at 3 times the rate of blank film and negatives at 15 times the rate of blank film. Positive prints incurred a duty of 1d (0.42 pence) a foot and negatives one of 5d (2.10 pence) a foot. Imports of unexposed film stock incurred a tariff of 0.33d (0.14p) a foot.

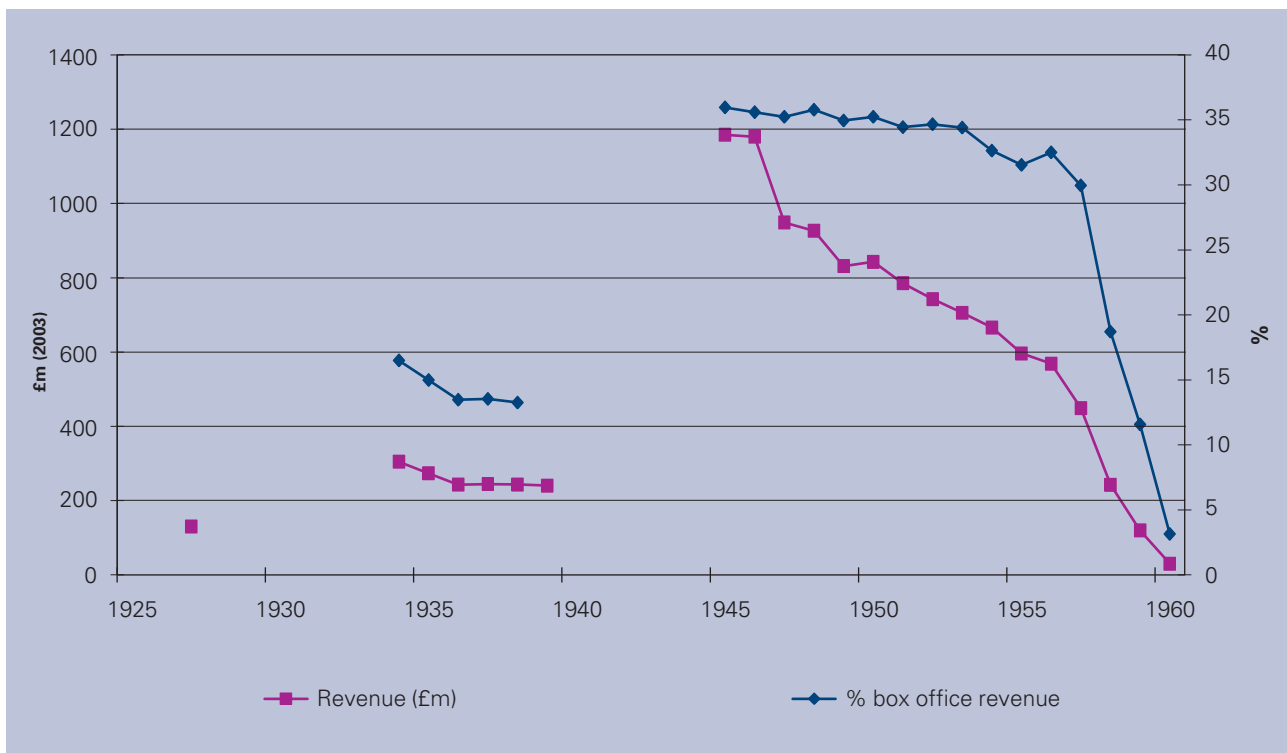
Entertainment Tax

This tax was introduced in 1916 on both cinema and other entertainments such as music hall and theatre, leading to a deadweight welfare loss. Total revenue grew from £3 million in 1917 to £12 million by 1921, 22 percent of entertainment revenue. Tax rates varied from 25 percent for the lowest-priced tickets to over 50 percent for some of the high-priced tickets. The regressive tax structure, together with the lower cinema ticket prices, increased the price of cinema relative to live entertainment, to the extent that this was passed on to the consumer.¹⁸ After a review of the system in the 1920s, lower priced tickets generally were not taxed and rates were slightly reduced.

17 A recent report by the House of Lords' Select Committee on Communications (2010) contains a brief overview of the UK film industry and discusses relevant present day policy issues

18 Band 1, for prices up to 2d had a tax of 1d, so 50 percent or more. Band 2 (2d – 6d) had taxes varying from 50 to 15 percent, band 3 (6d-30d) 33 to 20 percent and band 4 (30d – 60d) 10 to 5 percent. Dickinson and Street (1985: 9).

Figure 2.2: Entertainment tax revenue from cinemas, in real pounds and as percentage of box office revenue



Source: ONS.

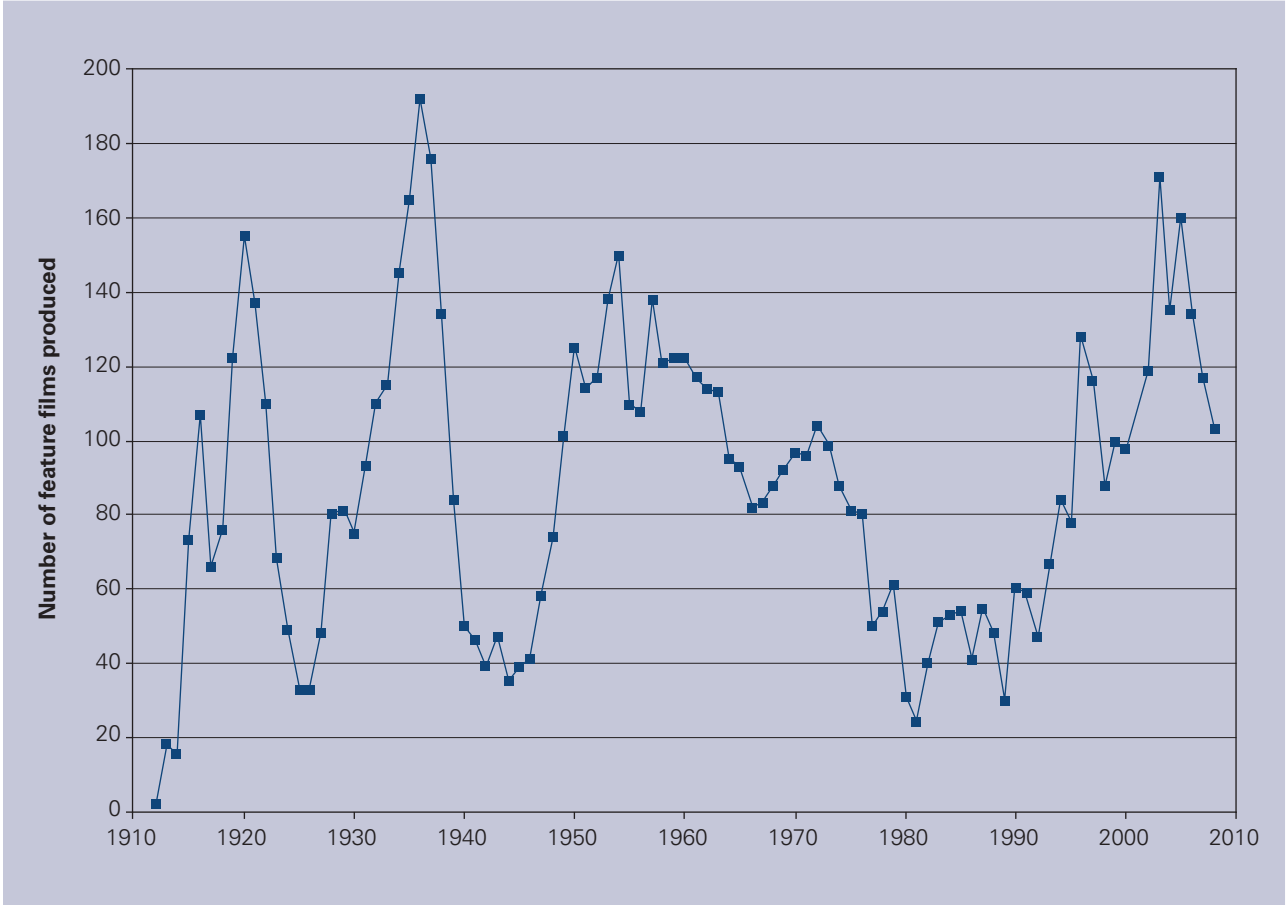
Between 1935 and 1946, live entertainments paid a far lower entertainment tax, further increasing the price of cinema relative to live entertainment. In the late 1930s revenue varied between 13 and 17 percent of cinema box office revenue. During the war the tax was increased and revenues grew to over a third of box office revenue, lasting until 1956 (Figure 2.2).

From then on the Treasury lowered the tax rate until it finally abolished it in 1960, when cinema employment was shrinking at 15 percent a year.

Film Quotas

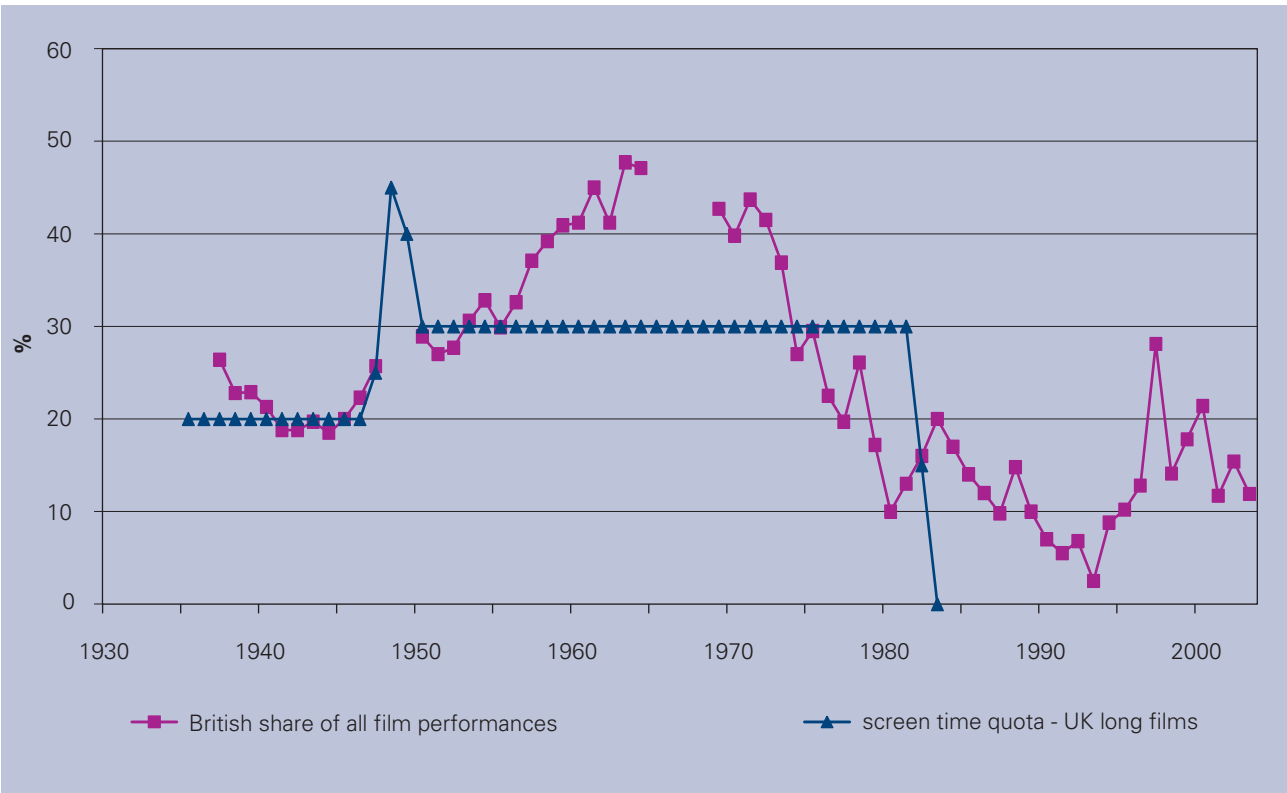
In the early 1920s, the number of British films declined sharply and the Government responded with the 1927 Cinematograph Films Act. It prescribed a percentage of screen-time in cinemas and a percentage of distributors' films which had to be British-made films. This started at 5 per cent for exhibitors and 7.5 per cent for distributors in 1928, rising to 20 percent for both in 1935. UK film production more than doubled by the end of the decade (Figure 2.3). But the policy was also blamed for creating a market for poor quality, low cost films, churned out to meet the quota requirements (so called "quota quickies"). The Cinematographic Films Act 1938 extended quotas for another ten years, and later acts kept quotas in force until 1983, although the UK-content percentage varied substantially over time (Figure 2.4).

Figure 2.3: The number of feature films produced in Britain, 1912-2008



Source: British Film Institute, Film Council Statistical Yearbooks.

Figure 2.4: The British share of cinema box office revenue in Britain, 1937-2004



Source: ONS Annual Abstract of Statistics; UK Film Council.

Exchange controls

During the war, the Treasury became concerned about US distributors remitting their UK profits back to the US, converting their pounds into dollars and so making it more difficult for the UK to buy American goods. The amounts fluctuated between £7 and £27 million annually between 1938 and 1948, which were substantial amounts (roughly between £250 million and £1 billion in today's money). The Treasury limited the amount US studios could remit and in 1947 applied a 75 per cent tax which led to a brief Hollywood boycott, during which UK film production shot up. Once those British films were ready to be marketed, the Hollywood boycott ended, and British firms, especially Rank, lost a lot of money. Eventually the exchange controls were abolished.

Levies and subsidies for British films

In April 1949, the National Film Finance Corporation (NFFC) was set up to distribute loans for film production. In 1950, the Government introduced the Eady Levy, which was a voluntary levy on a proportion of the price of cinema tickets; half retained by the exhibitors – in effect an Entertainment Tax rebate – and half going to the makers of British films, in the expectation that it would be used to fund new British film productions. This arrangement, short of a direct subsidy, was partly to meet GATT rules on state aid to film. The Eady Levy was made compulsory in 1957 and remained in place until 1985.

Tax credits

From the late 1970s, British film production outlays qualified for certain investment tax credits, which were abolished in the mid-1980s, together with quotas, the Eady Levy and the NFFC. A few years later the Government took other steps to help the industry. In 1991, it established the British Film Commission. In 1992, it introduced tax relief for production expenditure through the Finance Act. In 1995, it decided to allocate lottery money to film production. In 1997, section 48 of the Finance Act permitted a 100 per cent tax write-off in the first year for films with budgets of less than £15m, which was intended to help independent filmmakers. In 1998, the Film Policy Review Group was setup. In 2000, The Film Council was launched, as a nondepartmental public body, absorbing a number of public and semi-public bodies.

In February 2004, the Inland Revenue introduced restrictions preventing the tax relief arrangements facilitating tax avoidance schemes. A recent report by the House of Lords (2010) noted that this 'caused the immediate collapse of a number of film projects in production or pre-production at the time, and the resulting uncertainty contributed to a downturn in film production, with employment dropping 33 per cent between 2003 and 2008¹⁹.

19 House of Lords 2010, page 19, paragraph 31, lines 6-10.

The Government conducted an urgent review of film tax relief and, in 2006, announced the introduction of a new film tax credit available for British films, which must pass a Cultural Test, or qualify as an official co-production.²⁰ Tax relief is up to a maximum of 80 per cent of UK production expenditure. In 2007/08, total tax credits amounted to £105m, 40 per cent of public film funding.

THE IMPACT OF THE AMERICAN FILM INDUSTRY ON BRITAIN

The quality race

Until the late 1900s, the British film industry was relatively successful, with substantial exports to the rest of the world, including the US, where it had at times a market share of about 20 percent. During the 1910s however, American producers started to spend large sums on heavily advertised feature films with famous stars based on famous stories. Although these films were far more expensive, they also attracted a far larger audience, and expanded the film audience as a whole, often at the expense of the lower-end fare of the theatre and music hall. Britain was not able to keep up with this quality race as the First World War made it difficult to get the venture capital needed to make bets on the future of the industry and winning film formats (Bakker 2005).

Two investment waves

As a response to the quota act of 1927, the Hollywood studios started setting up their own subsidiaries in Britain or backed British productions to fill their quota. Warner Brothers, for example, set up its own UK production arm and MGM built a studio in Hertfordshire, while United Artists had an output deal with Alexander Korda's London Film Productions. The American investment was important, first in increasing domestic production and second in enabling US and world-wide distribution for the British films they backed.

During the mid-to late 1930s, average production costs of films made in Britain were about \$150,000. American production costs were at least twice as much on average, and French production costs were about a third lower, \$100,000, at exchange rate. Italian production costs may have been two-thirds lower, at about \$50,000 per film, on average.

In the 1950s and 1960s, the Eady Funds and advantageous US tax legislation encouraged US studios to increase their investment in the UK. They bankrolled many iconic British productions, including *Bridge on the River Kwai*, *Lawrence of Arabia*, and the James Bond films.

20 In order to obtain the tax credit, film projects need to pass a Cultural Test, scoring at least 16 points out of a possible 31. They are awarded points for: cultural content (16 points; story in UK, characters British, British novel, English); cultural contribution (4 points; reflects a diverse British culture, heritage or creativity); cultural hubs (3 points; studio, filming or postproduction in UK), and cultural practitioners (8 points; cast, crew and producers British or from EEA).

US tax regulation

In 1971 the new US Revenue Act allowed film companies to write off 7 percent (later 10 percent) of production expenditures against taxes and enabled them to form Domestic International Sales Corporations which could indefinitely defer tax on half the profits earned from exports. A 1969 act already allowed individuals to write off 100 per cent of their film investments against taxes. On top of that, new financial and syndication rules of the Federal Communications Committee gave Hollywood major investment opportunities in the American television industry (Puttnam 1997).

The result was a sharp drop off in US finance in Britain. Imported capital by UK subsidiaries of US firms averaged £19 million annually between 1965 and 1972, then imploded to £4.8 million in 1972, averaging just £6 million annually between 1972 and 1979 (all in current pounds). If we take into account inflation, the drop was far worse.²¹

Most of the tax incentives were abolished by 1985, when Hollywood was back on its feet again, and during the 1980s inward investment in Britain picked up considerably. Nevertheless, the episode showed the sensitivity of British film production to developments in the American market and its dependence on the 'free investment attitude' of the Hollywood studios and the US state, leading Hollywood firms to invest anywhere they can get the highest return, unhampered by cultural legislation or political pressure.²²

THE INDUSTRY STRUCTURE

Extreme vertical integration through ownership and revenue-sharing

The film industry's structure is determined by the fact that marginal revenues largely equal marginal gross profits. This means, for example, that marketing expenditure is efficient until the last pound spent on marketing equals the last dollar of box office revenue received. To create incentives for efficient expenditure, the industry is vertically integrated, sometimes through outright ownership – such as a distributor owning a producer – or through revenue sharing contracts that partially align incentives. The industry's value chain is therefore best studied as a whole (Table 2.2).

21 Data from Dickinson and Street (1985).

22 Should the US reintroduce very strong tax incentives or should the US film industry get caught in a 'buy American' ideology, the consequences for British film production might be dire.

Table 2.2: Stylised overview of the value chain of the UK film industry

	Creative inputs	Finance	Production	Studios	Distribution	'Exhibition' (cinema, DVDs, TV)	Consumers
Scarcity	Intermediate	High	Low	Intermediate	High	Intermediate	Low
UK distinctive Capability	High	High	High	High	Low (dom) High (int.)	Low	High
UK ownership of activity within UK	High	Intermediate	Intermediate	Intermediate	Low	Intermediate	High
Industrial concentration	Monopolistic competition	Intermediate	Low	High	High	High	Low
Trade balance	Exports	–	Exports	Exports	Imports	– (exports if foreign tourists watch more than UK tourists)	
Regulation / policy	Income tax policy	Tax credits (1970s – 1985; 1992-2006)	NFFC (1950-1985) Tax credits (2006 –)BBC Films Film4 (1982 –)		Quotas (1927-1985) Exchange controls (1940s) Advertising and print fund UKFC (2003-)	Quotas Eady Levy (1950-1985) Entertainment tax (1916-60)	Restriction of consumption times (e.g. Sunday openings)

Creative inputs

This activity shows a dual market structure. Top creative inputs are relatively scarce and can demand high fees, while there is an abundance of the lowest level creative inputs working at low wages. Because the box office performance of the inputs diverges enormously,²³ it might well be the case that in both markets wages equal the marginal revenue product of the inputs.

Britain has a distinctive capability in this area, as it has a good supply of star performers, writers, directors, composers and designers that have an international appeal and contribute substantially to exports. Britain is also a leading supplier of supporting services such as talent agencies, lawyers, talent management and rights management companies. The latter partially link to Britain's comparative advantage in finance. Few policy initiatives have been developed in this area.

Finance

Production finance is provided by the major distributors, or by specialised financing companies. In the latter case, finance depends on a big distributor giving a minimum guarantee, which can then be discounted at a bank. While distributor-financing is highly concentrated and almost exclusively done by the Hollywood studios, boutique financing is far more fragmented and includes many specialised British firms.

²³ See Bakker (2001, 2003) for an overview of early quantitative studies by US and British film companies to measure the box office performance of star actors and directors

Major policy initiatives were the late 1970s tax credits, lasting until 1984, and the 1990s tax credits, abolished in 2004. Since 2007 tax credits are aimed at production companies and financing firms can only indirectly benefit from them.

Production

Production is highly fragmented. In the past, many production companies would be owned or linked to major distributors. Since the 1930s Rank, for example, owned several production companies, as did ABPC and later Thorn-EMI. Nowadays, some major British production houses have deals with US studios. Working Title Productions, for example, (makers of *Four Weddings and a Funeral* and the *Bridget Jones* films) had an output deal with PolyGram, and now has one with Universal Pictures, while Aardman Animation has a similar deal with Columbia/Sony, and Danjaq, makers of *James Bond*, with UA-MGM/Sony.

The UK's distinctive capability in production has been high, with UK producers making landmark films and US, French and other foreign companies being happy to invest in them. Film production is also a major export earner, with on average, 60 percent of it being paid for with funds from abroad. Policy initiatives in this area included the National Film Finance Corporation (1950-1985) that gave soft loans and the production tax credit introduced in 2007.

Studios

Studios became quite concentrated from the 1930s onwards, with Rank owning many studios. Ever since then a few big studios have dominated British film production, mainly Pinewood and Shepperton (now part of one company) and, since 1995, Leavesden, a transformed Rolls Royce aircraft factory slightly larger than Pinewood.

While studios in Britain were often vertically integrated with distributors, today the picture is mixed. Pinewood is quoted on the London stock exchange and recently made an investment in a Canadian studio.²⁴ Leavesden Studios is also independent but has a long-run deal with Warner's.

During the 1980s studios moved from full-service outfits to flexible specialisation, in which the supporting services (such as lighting, costumes, set building, equipment hire) would not be provided by the studios anymore but by a myriad of service firms who would rent space on the studio lot.

The distinctive capability of the UK in this area is high, with good skills and many top films shot at British studios, including iconic science fiction movies such as *2001: A Space Odyssey* (1969), *Star Wars* (1977) and *Superman* (1979). Industrial concentration is high, although a dual market structure exists with a few large studios having lots of service companies on their terrain, and many small studios.

24 One of the two main European competitors of Pinewood Shepperton PLC, Babelsberg Studios near Berlin, is also quoted on the stock market.

Distribution

In the film industry, the key significant firms were in distribution. Nowadays the Hollywood distributors operate large international distribution machines that use films as input and turn out a cash flow. This is the key competitive advantage of the Hollywood majors. It is estimated that it would cost at least one billion US Dollars in uncollateralisable cash and ten years to build an international distribution organisation from scratch, and profits might be low as incumbents will fight entry.²⁵ The Hollywood firms then finance external film productions from their cash flow, or give minimum guarantees to producers, commitments to distribute the film and at least pay the specified minimum, however it performs. Producers can discount these guarantees at a bank. The majors also produce some films in-house. So while the international distribution machine and the financing ability are the key competitive advantages, significant firms can also own cinema circuits, production companies and studios.

By the 1930s, the US studios were fully integrated, each owning a production division, a studio, an international distribution network and cinemas. In 1948 they were found guilty of collusion by the US Supreme Court and ordered to divest their cinemas. They also generally exited film production and studios, financing and contracting for productions on a per-film basis with external companies.

The main policy initiative in the area of distribution were the quota acts (1927-1983) setting distributors' quotas for the number of UK films to distribute, and the war-time policy to restrict the remittance of distribution profits to the US. In recent years, the UK Film Council has instituted an advertising and prints fund of about £4 million a year to subsidise the distribution of smaller movies.

Exhibition

Exhibition concerns the final sale of viewings of the film to consumers. This has always been done in a way to price discriminate between consumers and maximise the surplus extracted. Before 1950 this was done by a successive series of runs, often six to eight, with each run slightly later at slightly lower prices. The well-to-do could see films for a few shillings at their West End opening, while others might see it a year later for just a few pence in its eighth run at their ramshackle neighbourhood cinema.

With the arrival of new technology such as TV and DVD, exhibition runs have generally collapsed into one or two runs, while the subsequent runs are now performed through other media, usually first on DVDs, then pay TV, then cable channels and lastly free-to-air TV, so that every consumer can see a movie at the price s/he is willing to pay, or see it several times at various prices and occasions.

Industrial concentration in UK exhibition is high. It increased steadily since the 1920s to reach a high by the early 1940s. Just a few firms came to dominate exhibition. In the 1983 the Monopoly and Mergers Commission finally acknowledged that exhibition was not competitive but was slow to act on its findings. Only six years later

²⁵ Rough estimate based on PolyGram's entry attempt between 1990 and 1998.

did it outlaw contracts between distributors and exhibitors for multiple exclusive arrangements, one of its findings (Hill 1993: 218). At that time, some of its findings were becoming irrelevant as new entrants, backed by French and American studios, opened the first multiplex cinemas in Britain, diminishing the incumbents' market power.

Policy initiatives in exhibition include the Entertainment Tax, the quota acts (1927-1983) and the Eady levy. At the local level, planning permission is relevant, as is competition policy to ensure free entry, as every cinema has a geographical monopoly the size of which depends on the distance to other cinemas and the distance consumers are willing to travel. Other relevant regulations included the restriction on Sunday openings.

THE ROLE OF SIGNIFICANT FIRMS

Distribution the key activity

Before the 1950s most large distributors were vertically integrated into production and exhibition. Major significant firms in the UK following this model were Rank and Thorn-EMI (ABPC) from the 1930s. New entrants came in from time to time.

The distinctive capability of distribution in Britain is low. Most is done by US companies and not a lot of special skills appear to be involved.

Possibly Britain does have a capability in international distribution. Two of the Hollywood studios, Universal Pictures and Paramount, have their international headquarters, for all non-US distribution in London, and a third, Warner's manages most of its global off-shore production from the UK. Apparently Britain has certain characteristics that make it attractive for those companies to set up international headquarters here.

Attempts to mimic Hollywood

British firms also attempted to enter global film distribution and compete head on with the Hollywood majors. Six major attempts were made since the 1930s, and all of these failed (Table 2.3). From the late 1970s to the late 1980s, for example, Cannon films set up an international distribution and finance network, backed by generous credit from the French state bank Credit Lyonnais, but failing after the takeover of MGM. The last attempt was by PolyGram Filmed Entertainment, owned by the Dutch Philips Electronics, but based in London. It was almost successful in establishing a new London based and Dutch-owned 'Hollywood' studio, but was eventually sold to Universal.

Nowadays remaining significant British firms are the large film studios, the film divisions of the public broadcasters (BBC Films and Film4) and several larger production companies with output deals with Hollywood distributors, such as the aforementioned Working Title, Aardman and Danjaq.

Table 2.3: British Entry Strategies in Global Film Distribution, 1931-1998

Name	Lifespan		Description of strategy	Specifics	How did it end?	Success of entry
	Organisation	Strategy				
Gaumont-British (UK)	1897-2004	1931-1937	FDI in distribution	Set up a US distribution company. Set up distribution companies elsewhere in the world, mainly in the British colonies.	FDI in international distribution.	Takeover by Rank; Rank embarked on a different strategy (below).
J. Arthur Rank (UK)	1936-1980s	1936- 1944	Alliance strategy;	Tried to reach scale by buying many British distributors, cinema-chains and production companies and merging them. In 1936 bought a 25% stake in Universal to guarantee US distribution access. Increased production outlays.	Strategic alliance with and equity in US distributor; minimum efficient scale.	Refocus in 1944 on FDI-strategy outside US, while to some degree retaining alliance strategy within US (with Universal and Fox as partners).
J. Arthur Rank (UK)	1936-1980s	1944- c. 1955	FDI in production and distribution	In 1944, sets up Eagle-Lion Film Distributors to distribute British films around the world. Eagle Lion Inc. produces B-films in Hollywood for distribution in US and around the world. Eagle-Lion buys cinemas and cinema chains in, among others, Australia, South Africa, Canada, Egypt, Portugal, Latin America, Ireland to some degree retaining alliance strategy within US (with Universal and Fox as partners). Increased production outlays.	FDI in international distribution.	Large losses on big-budget films in late 1940s. Difficulties to make films that reach sufficient US BO revenues. Films often culturally specific (e.g. Norman Wisdom) Decline of film attendance Diversification of Rank Organisation (Rank-Xerox).
International Film Finance Corporation (UK)	1967-1971	1967-1971	Contractual strategy	Coordinating office in London; distribution office in Paris; headquarters on Bahamas. Company invests in films, distribution office gets advance contracts from distributors around the world.	Transaction cost economics; trying to replicate the intra-firm transactions inside the global film producers-distributors through the market.	Distribution contracts often not enforceable; bankruptcy of US distributor (Winthrop Laurence Corporation) caused IFFC's main backer, the bank Morgan Grenfell, to close it down. Films also seemed to lack enough revenue-generating capacity, except for the first one, <i>Shalako</i> , with Sean Connery and Brigitte Bardot.

Cannon Group (UK/US)	1966 -	1979-1987	FDI in production and distribution	Acquisition of local distributors; acquisition of smaller production companies and film catalogues; acquisition of cinema chains. In the Netherlands, Italy (bought from Gaumont), Britain and other countries. Financed by Credit-Lyonnais, a state-owned French bank.	Making many smaller acquisitions.	Holland, Italy, UK, Germany, France, alliance with MGM for US distribution; financing problems and SEC investigation.
PolyGram (UK/Netherlands)	1962-1999	1990-1999	Resource-based strategy	Assembly strategy; Buys a lot of smaller companies and merges them into a new global producer-distributor. Set-up or acquisition of distribution subsidiaries in all major film markets. Uses a different, more decentralised production model ('labels') than Hollywood uses.	Does the same activity (feature film production and distribution) in a slightly different way.	Takeover of PolyGram by MCA Universal.

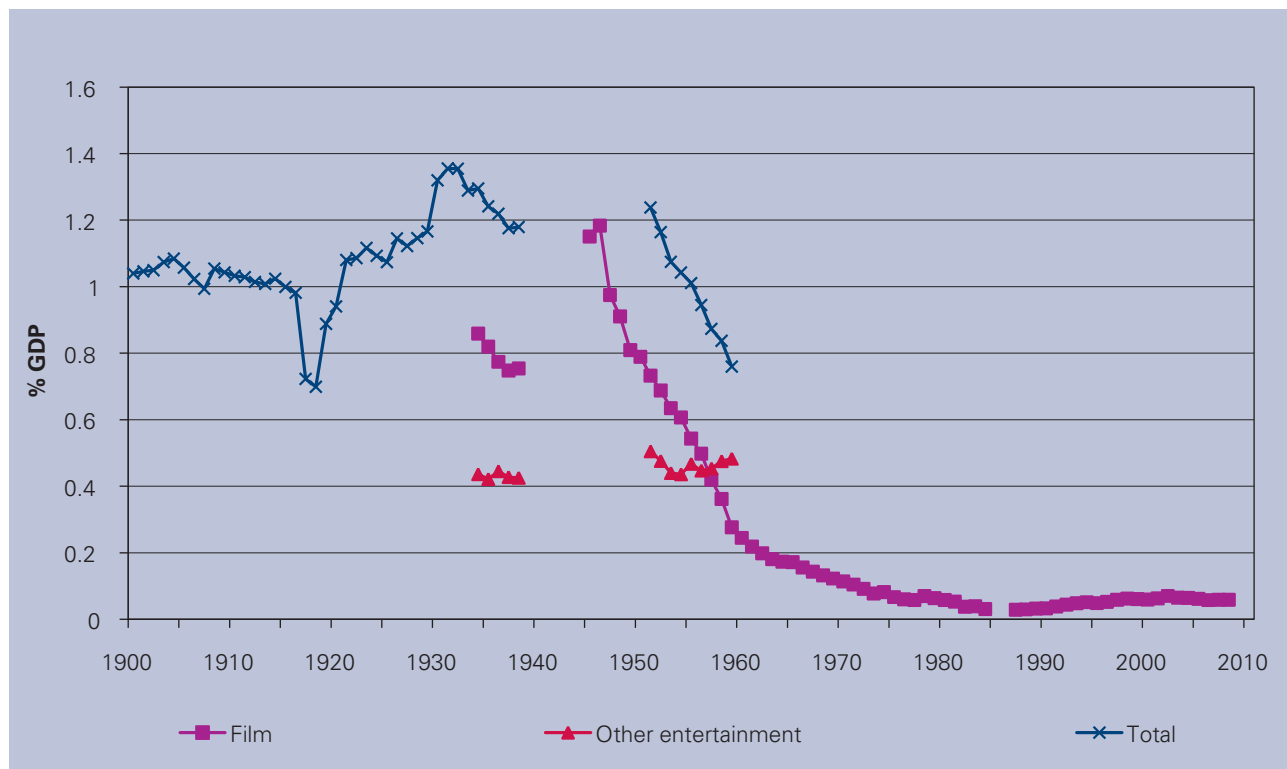
Source: Bakker (2007).

THE FILM INDUSTRY'S IMPACT

Share of GDP

The GDP-share of cinema box office revenue has fallen enormously since the 1930s. It fluctuated around 0.8 per cent at that time, and reached a peak of 1.2 per cent during the war. Then it fell steadily reaching 0.2 per cent in 1960 and then gradually decreased further until an all-time low of 0.025 per cent in the mid-1980s, after which it doubled to 0.05 per cent today (Figure 2.5).

Figure 2.5: Box office cinema revenue and other entertainment as percentage of GDP 1900-2008



Source: Bakker (2008) and ONS.

Even if we add the film revenues from all other media, such as DVDs and TV, the share remains low, and was 0.3 percent in 2008, which is still only a quarter of its peak value. This decline in GDP-share reflects two things. First of all, structural change: as society gets richer it is able to produce more new goods and services and older sectors generally will decrease relatively, as a percentage of all goods and services, because of this. Second, industries with large productivity growth, i.e. 'successful' industries, will get a smaller GDP-share; although they may look less important than some larger industries, they may have been better able to increase productivity, so small often means beautiful. These industries were like thieves in the night, in that their phenomenal contribution to our welfare often goes unnoticed (Bakker 2009).

Time and money: the full cost of entertainment

Although the money we spend per hour on watching movies decreased, the value of an hour increased enormously, making the share of movies in GDP weighted by their full costs (price plus opportunity costs in the form of lost wages) increase. In 1934, for example the price of a film ticket was 4 pence (£2.05 in today's money) and now it is £5.18, a growth of one percent per year. At the same time, real wages grew on average by 1.8 percent a year. So in 1934 the full cost of a 2.5-hour cinema visit was $£2.05 + (2.5 * £3.39) = £10.53$, while today the full cost is $£5.18 + (2.5 * £12.77) = £37.11$, meaning that the full cost of a 2.5 hour cinema visit has increased by 1.7 percent annually. In 1934 the ticket price was 19 percent of the full cost, now its share has declined to 14 percent.

When we also take into account films on DVD and TV, Britons spent 7551 million hours watching films in 2008. This is 2.4 per cent of available time for work and leisure and 3.7 per cent of available leisure time. Expenditure as a percentage of GDP was just 0.3 per cent. This shows films are about 8-12 times more important in Britons' lives than their GDP-share would suggest. The expenditure on films was £3.7 billion, the opportunity cost – what Britons could have earned if they worked during that time instead of watching films, was £96 billion (7551mln hrs * £12.77/hr).

The average price per hour was roughly £0.49, which compares to a 1934 price of £0.82 an hour, a real price decline of 0.7 percent per annum. Average full costs per hour were £13.20, which compares to the full costs per hour of £4.21 in 1934, a real increase of 1.7 percent per annum.

The export performance of the British film industry

Little reliable export data is available for the early British film industry. Nicholas Crafts' (1989) analysis of British exports includes the aggregate 'Books and Films', which are examined in terms of revealed comparative advantage, the share of UK books and films of world books and film exports over the share of all UK exports in all world exports. In 1913 'books and films' ranked 13th out of a total of 16 sectors, coming only before 'bricks and glass', 'wood and leather', and non-ferrous metals.

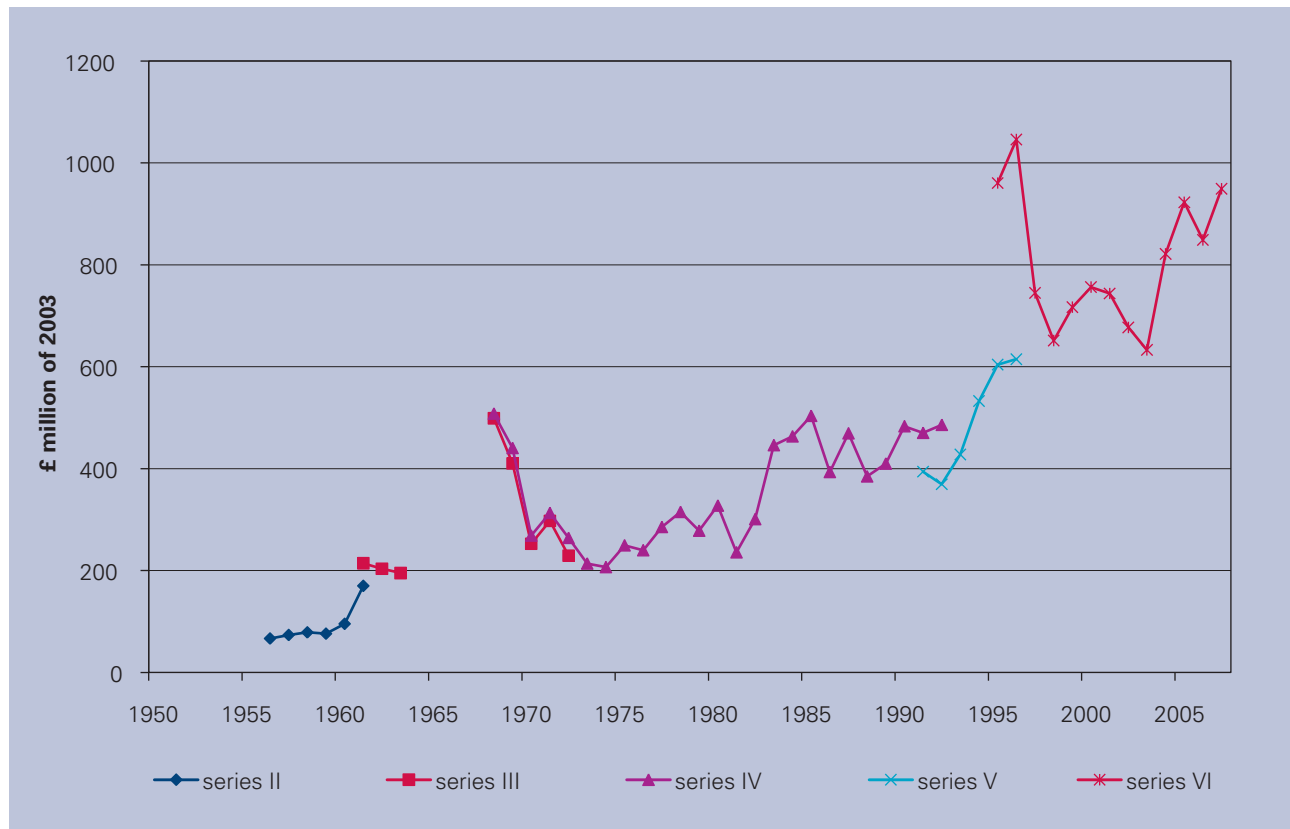
By 1937, 'books and films' ranked 8th, well before 'iron and steel', 'cars and aircraft', chemicals, metal manufactures, 'wood and leather', 'non-ferrous metals' and agricultural equipment. This constituted a remarkable shift in export performance and was evidence of how entertainment was becoming a more competitive export product than many of the basic staple industries. Unfortunately, lacking disaggregation, it is unclear how much of the export performance was attributable to books and how much to films.

It is clear that during the 1940s, Britain ran up a significant balance of trade deficit in motion pictures with the US. Given the concerns of the Treasury at the time and the measures it introduced to mitigate the repatriation of profits, it is likely the situation was not as severe in the 1930s. Also, Britain's motion picture trade balance with other countries might have been positive.

Since the mid-1960s, when reliable data become available, there has *never* been a trade deficit in film, not even for a single year (figures 2.6 and 2.7). This is an outstanding achievement, and vindicates British policy since the 1950s to encourage US studios to invest in Britain rather than forcibly retain their earnings in Britain.

Britain had a substantial positive trade balance with most countries in the world (figure 2.8). Even with the US the balance was positive for some years, and only moderately negative on average for the last three years.

Figure 2.6: Real UK film exports, 1956-2008



Note: the various series are not entirely compatible, but do seem internally consistent. The last series, based on an ONS survey, takes into account royalty exports and exports of production services; earlier series also appear to do this, but use different methodologies. The levels of the series are therefore not fully comparable.
Source: ONS.

Figure 2.7: The UK trade balance in film as percentage of total trade, 1961-2008

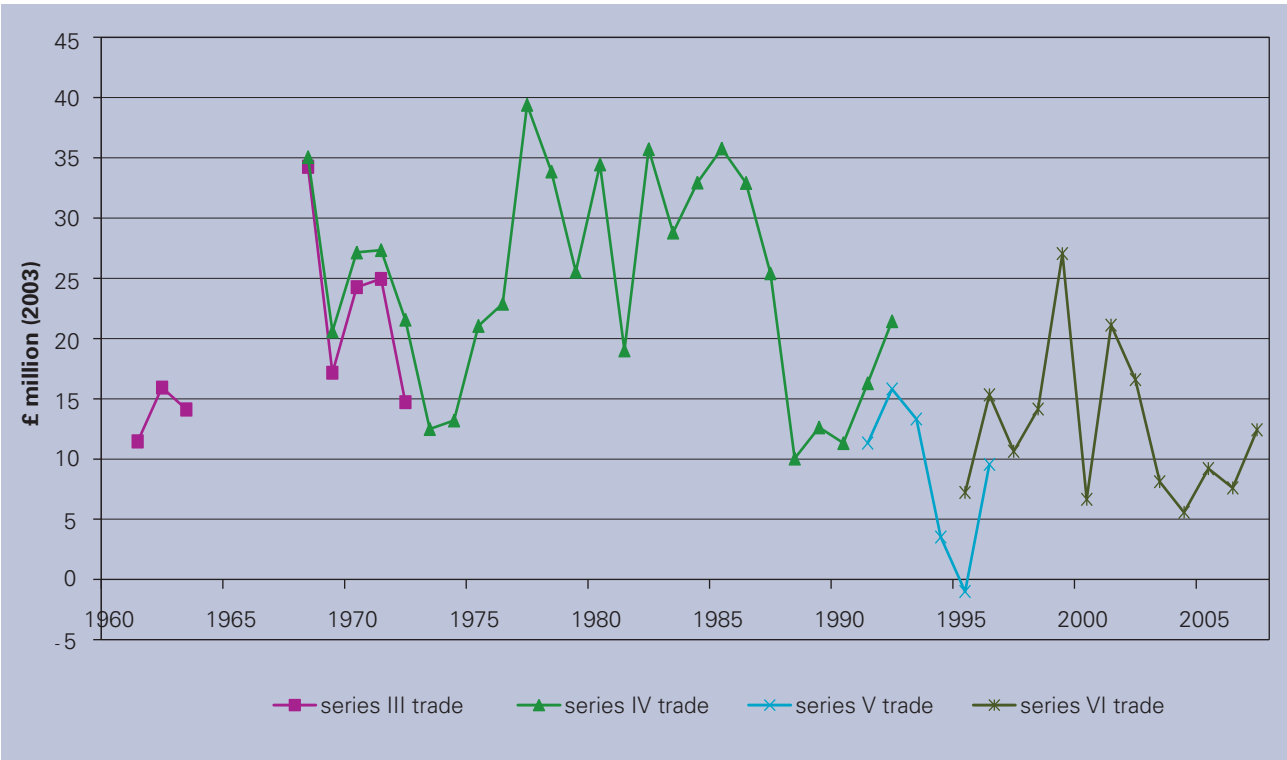
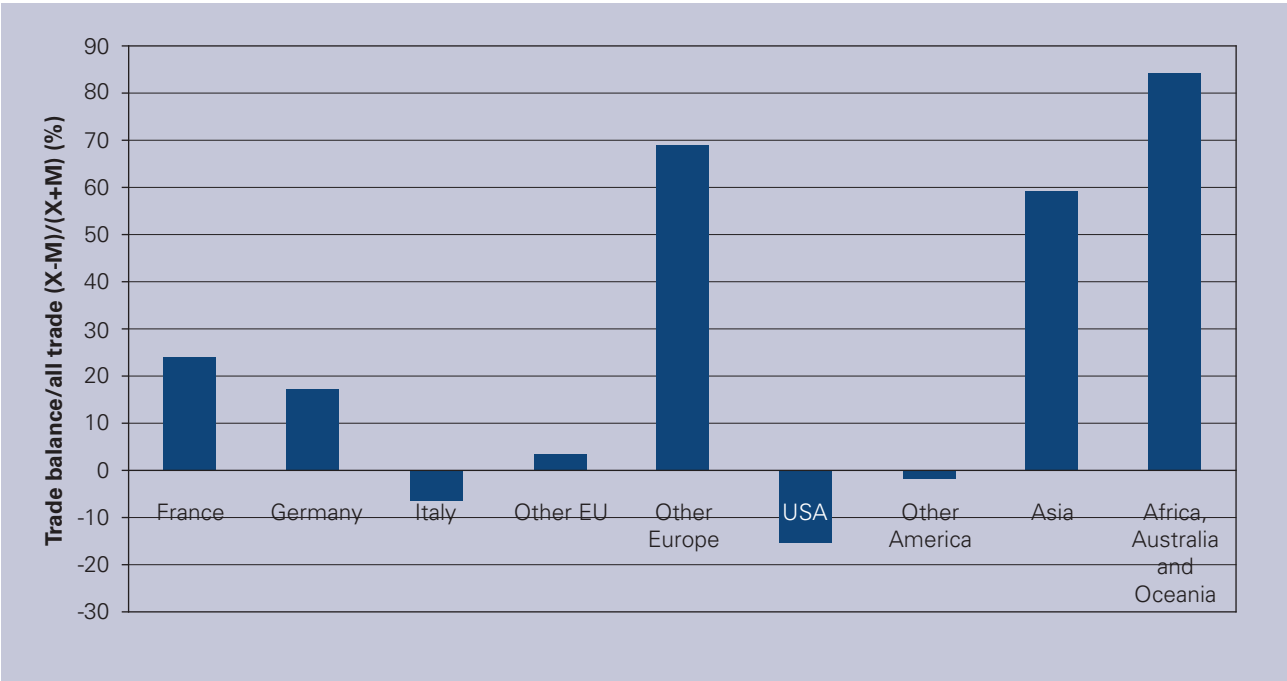


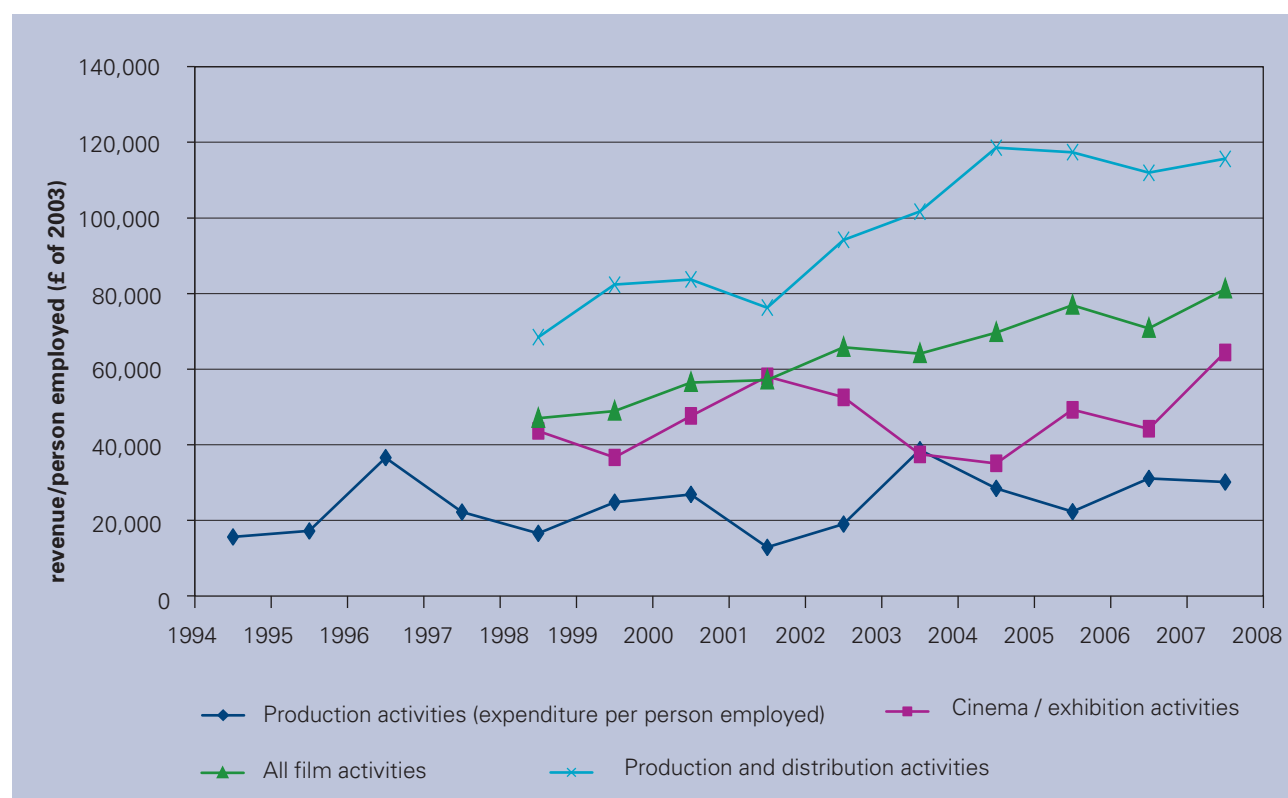
Figure 2.8: The UK trade balance in film as percentage of total trade with various countries, average for 2005-2007



Productivity

It is notoriously difficult to get good output, employment and capital data for the film industry. Not all have been collected in consistent historical time series by the ONS. This means that a precise series of TFP-growth or even labour productivity growth cannot be given. However a rough estimate has been made for all spectator entertainment for 1900-1938: output grew by 3 per cent per annum, capital and labour by 4 and 2 percent, and TFP by 0.8 per cent (Bakker 2004). Some rough labour productivity indicators can be inferred from recent figures (Figure 2.9). The average real revenue per person employed grew from about £43,000 in 1998 to about £80,000 now, a growth of 6.4 per cent per annum, which is high. Most of this was driven by a sharp increase in 'productivity' of persons working in film production and distribution, while 'productivity' in cinemas fluctuated substantially but with a stable trend rate.

Figure 2.9: Real revenue per employed part-time and full-time person in the UK film industry, 1994-2007



Source: UK Film Council, Statistical Yearbooks.

Note: Production and distribution activities data is based on total film activities revenue per person employed in distribution or distribution.

Cinema and exhibition activities data is based on cinema revenue per person employed in cinema activities.

Production activities data is based on production expenditure per person employed in production.

The benefits and costs of Government intervention in the film industry

Potential reasons for intervention in film can be grouped into 5 categories (Table 2.4). Because not all benefits can be quantified, even if only in principle, a quantification of benefits and costs is challenging.

Table 2.4: The benefits and costs of intervention in the UK film industry

	Reasons for intervention	Benefits	Costs
1920s, 1930s and 1940s:	1. The cultural argument	UK consumers' utility improved because of increased number of films with culturally British content	
		UK consumers' utility improved because of increase in variety (horizontal product differentiation)	UK consumers' utility diminished because of fewer top-quality (US) films being screened (vertical product differentiation)
	2. Trust busting	Remedy of market failure: Hollywood collusion and export cartel Lower film rental prices	UK resources in film production that could be used for different activities UK financial investment bubble and bust (1937)
	3. Balance of payments	Fewer remittances of UK profits of US film companies Improvement of balance of payments / reduction of 'dollar deficit'	Potential trade friction with the United States
	4. Path dependent agglomeration benefits	Marshallian externalities: safeguarding / development of UK industrial film district	Would the resources tied up in film have been more effectively deployed in other creative industries?
		Jacobs externalities: reinforcing UK's strength in the creative industries through the London industrial district	Would the resources tied up in film have been more effectively deployed in other creative industries?
	5. Political / trade	Promotion of UK culture, products and lifestyle in the empire and across the world 'trade follows the film' Propaganda during war	
	6. Increasing fiscal revenue	Entertainment tax revenues (1916-1960) Import tariff (1916 –)	Deadweight welfare loss Distorted price cinema tickets relative to live UK film market size below its potential
		Additional benefits	Additional costs
Post-war		Trust busting less of an issue: US studios found guilty of collusion by US Supreme Court in 1948; Hollywood boycotts and threats dwindle after 1950 UIP export-combine of 3 Hollywood studios (dissolved in 2007); Web-Pommerene Act still allowed US studios to form export cartel	Eady levy paid by cinemas
		Balance of payment issues become less pressing	Direct Government subsidies by committee
		Hollywood produces many US films in UK and bankrolls about 2/3 of UK production expenditure	Tax breaks
			Film production by public service broadcasters (Channel 4 (Film4), ITV, BBC Films)

The most important reason for intervention (and one that is still allowed by the EU and WTO nowadays) is the cultural argument. Whether the costs here outweigh the benefits depends partially on consumers' love of variety versus love for a higher quality product of the same variety. Economic theory (Krugman 1979) and empirical research suggest that consumers have a strong preference for variety. Broda and Weinstein (2006), for example, find that the benefits of the increasing variety of imports for US consumers between 1972 and 2001 amounted to 2.6 percent of GDP. It is unclear whether the consumer gain because of more variety through the availability of British films outweighed the loss in over-all quality.²⁶ It is clear that the Government at the time considered the variety argument important and used it as one of the justifications of the quota policy. In fascist Italy, for comparison, the same argument was used for the obverse policy – as a justification of why Italy should still import foreign films rather than making all films itself. The variety argument was important for not blocking all access. So this is clearly an issue that policy makers consider important and that would probably benefit from future research.

Another benefit from intervention in the interwar and postwar period was the remedying of the market failure caused by the collusion of the Hollywood studios. Although its effects cannot exactly be quantified, they were eventually found guilty of collusion by the US Supreme Court in 1948. Rough estimates by the author imply that margins for the three Hollywood majors RKO, MGM and Warner Brothers fluctuated between 40 and 60 percent between 1934 and 1941, showing a substantial degree of market power. To the extent that it may have mitigated the market distortion by the Hollywood cartel, the 1930s quota policy shows some similarities to the 'rent-switching argument' discussed by Nicholas Crafts in the introduction to this volume, although the Government did not give subsidies, but used selective/partial protection instead.²⁷ The lack of competition continued after the war. Inquiries by the Monopoly and Mergers Commission in 1966 and 1983, found the exhibition market 'detrimental to the public interest' (1966) and found that a 'complex monopoly' (1983) existed in exhibition and distribution. In both cases, however, little action was taken.

Other benefits of intervention included improvement of the balance of payments, international and empire trade promotion of UK goods and services, political propaganda, and path-dependent agglomeration benefits.²⁸

The costs of intervention before the 1950s were more limited than after because intervention consisted purely of protection and not of direct subsidies or semi-public companies like Film4 or BBC Films nowadays. Besides utility decreases because of lower average quality, the main costs were the opportunity costs of the resources tied up in film production, which were made explicit by the financial bubble and then sharp bust (in 1937) of private investment in UK film production. Nevertheless, as during much of the 1930s the UK economy was producing below capacity, opportunity costs of resources were probably far lower than in other periods.

26 It should also be noted that the average ticket price for UK films nowadays is slightly higher than that for non-UK films (UK Film Council Statistical Year Book).

27 The quota policy was not entirely unlike the voluntary export restraints that the European Union and the United States would negotiate with Japanese car and consumer electronics manufacturers in the 1980s and 1990s. However, those manufacturers were not proven to form a cartel and thus the justification of remedying market failure / switching rents would be less strong.

28 The latter will be discussed in detail in the last section of this paper.

A political cost consisted of trade friction with the United States and the threat of retaliation if protectionism was too overt. The US threatened France, for example, with high import duties on French wines, when it wanted to increase its protection against US films in the 1930s (Ulf-Moeller 2001).

Although it is challenging to qualitatively make up the balance, if the cultural argument is assumed to be important and the overriding reason for intervention, then before 1950 the cost appears to have been comparatively low. After 1950, public intervention increased through direct intervention in the form of levies, subsidies, tax-breaks and semi-public organisations. This undoubtedly increased the costs of intervention, while it is difficult to establish whether at the same time the benefits increased. Hollywood collusion appears to have become slightly less of a problem. Since at least the early 1960s Britain had a consistently positive trade balance in film production, and many top international films, such as *Bridge on the River Kwai* (1956), *Lawrence of Arabia* (1962), *2001 A Space Odyssey* (1969), *Star Wars* (1977), and nowadays *Harry Potter*, were shot in Britain and acquired a partially British character because of that. Although these films are less specifically British and more like Hollywood blockbusters, they do make those blockbusters more British and might thus increase the 'variety-utility' of UK consumers a little bit while not compromising their 'quality-utility', i.e. those films make a different trade-off between horizontal and vertical product differentiation than other British films.²⁹

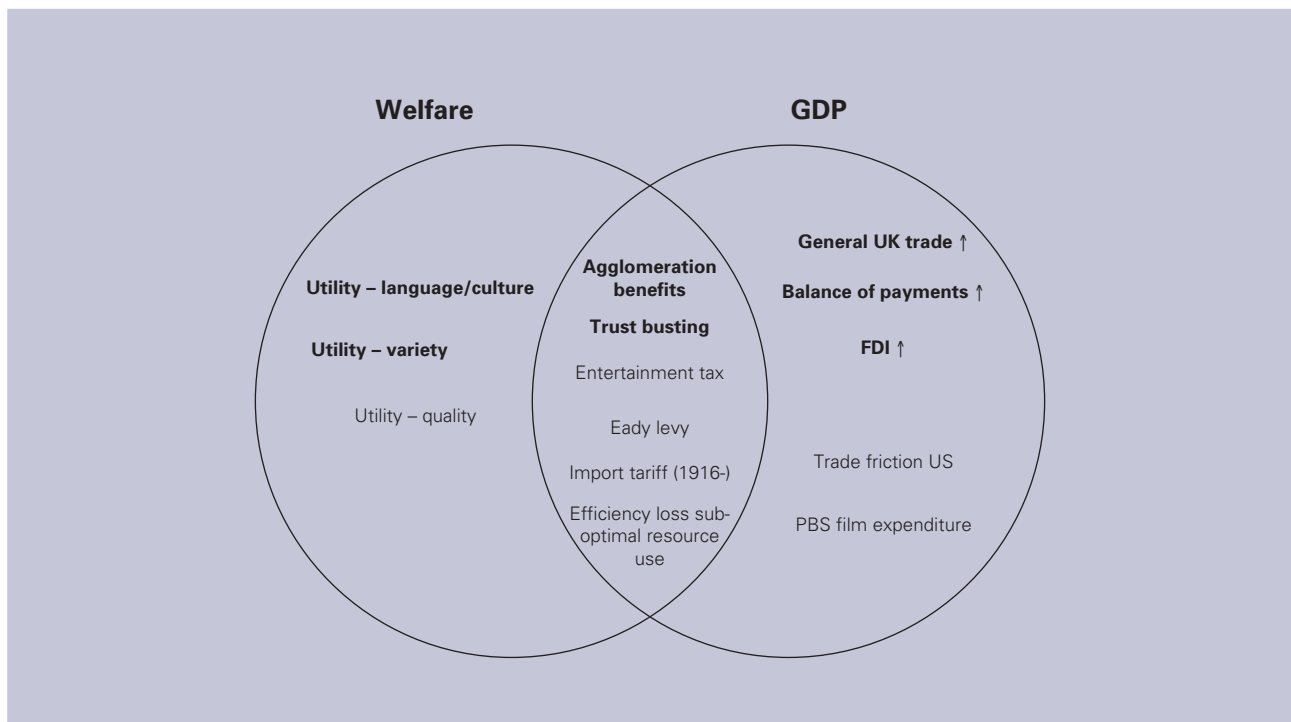
In all, it remains a question whether the sharply increased costs of intervention, in the light of diminishing Hollywood overt and tacit collusion, outweighed the benefits of massive Hollywood inward investment, and a different utility mix for UK consumers. Quantifying the various costs and benefits is challenging and something on which future large-scale research projects might focus.

Interestingly, the largest benefits both in the pre-war period and in the post-war period seem to have arisen with little monetary costs of direct Government expenditure/subsidies/tax breaks. In the 1930s this was achieved through protection, and in the post-war period the sharp surge in US FDI in British film production was achieved by soft diplomacy (and, admittedly the Eady levy and from the late 1970s increasingly tax breaks and subsidies).

Figure 2.10 summarises the various costs and benefits discussed above. The welfare benefits could have been substantial, while it remains the question how important the three 'pure-GDP' benefits have been. A key issue remains how the various welfare gains and losses summed, and whether the gains dominated the losses.

29 For example, more British consumers probably saw Sir Alec Guinness in *Star Wars* than in any other one of his British films.

Figure 2.10: Venn-diagram of the potential welfare and GDP effects of Government intervention in the UK film industry



Notes: Bold font means a presumed benefit, normal font a presumed cost.

LESSONS

1. The Treasury's attitude towards new industries in the early 20th century hampered the growth of the UK sector. Entertainment tax was only abolished in 1960 when it almost killed the UK exhibitors. Future policy might refrain from industry-specific taxes and specifically avoid targeting new and growing industries. Today's equivalent to the Entertainment Tax would probably be a tax on videogames, mobile phones or internet usage.
2. Incentives to encourage inward investment have been successful in attracting US film production to Britain. Since reliable data begun in the 1960s, Britain has always had a substantial trade surplus in film, a sharp difference with the 1940s, when it was running large deficit. US firms have bankrolled on average 60 percent of UK production expenditure, and the UK film industry is competitive internationally.
3. Several general types of restrictive regulation and practices can hamper the growth of new industries. Sunday opening hours, for example, severely constrained the exhibition sector well into the 1970s, and restrictive union practices affected film production at least until the mid-1980s.
4. Competition policy needs to respond quickly. Until the 1980s, for example, it seemed rather inactive until the 1980s leaving a few companies to dominate exhibition. When it became active in the late 1980s, the MMC did find exhibition was not competitive, ironically new entrants had already opened the first multiplex cinemas in Britain.

5. Policies to develop existing agglomerations, in this case in and around London, can play an important role. Future policies might involve improving internal and external transport infrastructure, education but also making the London district as amenable as possible to top creative and technical inputs from around the world, creating a 'Planet London', a city attractive to live in, a microcosm, perhaps the Athens of a globalised world.

6. The 1930s quota policy provided protection for UK films and could be viewed as a 'rent switching' industrial policy. The policy succeeded in increasing the number of UK films and may have contributed to greater capacity in the UK film industry. However, the policy altered the incentives for the industry and had the unintended consequence of encouraging poor quality, low cost films.

2.4 The evolution of the British recorded music industry

THE INDUSTRY NOW AND THEN

Data on the recorded music industry are hard to come by and overlap with several different sectors, such as literary creation and live entertainment. DCMS calculated that in the music and visual and performing arts as a whole, 31,200 businesses were active in 2008, and that employment was 262,800 full-time and part-time persons in 2007.³⁰ The category 'music reproduction firms', which includes small record companies, 'and suppliers of music instruments' counted 5,300 firms, employing c. 15,000 persons and having a turnover of about £1.7 billion in 2005 (Frontier Economics, 2005). Although the latter category comes somewhat closer to the UK recorded music industry, the various different classifications make it difficult to establish the sector's size precisely. According to a recent survey by the British Phonographic Industry Association, in 2007 £219 million was spent on Artists & Repertoire (finding, developing and producing talent), the R&D of the music industry.³¹

Total 2008 UK sales were £1,289 million. In 1930, the first year for which reliable data are available, sales were £240 million in today's money, showing an annual real growth of 2.2 percent over the last 78 years, over five times as fast as population growth. Expenditure per capita increased from £5.23 in 1930 to £21.01 today. The growth rate was almost three times that of the British film market over the same period. However, as will become clear below, this average hides extremely large fluctuations. Since its peak in 2001, for example, real music expenditure has halved, shrinking by 9.6 percent per year, on average.

30 DCMS, Creative Industries Economic Estimates Statistical Bulletin, January 2009.

31 Survey by BPI in association with Media Research Publishing quoted in correspondence with Chris Green, BPI.

TECHNOLOGY

The first important innovation, recording and playing back music through the phonograph or the gramophone, made music tradable and created the modern music industry. The British Gramophone Company, who would later become part of EMI was one of the industry's leading firms, and one of the largest firms in the world as well, manufacturing players and records in many countries (Jones 1985). The industry's further development has been shaped by a succession of new products. In the 1920s radio arrived, providing both a complement and substitute for records, in the 1930s jukeboxes were introduced, and in the 1940s the LP and the EP, merging into one compatible standard in 1952 (Table 2.5). In the 1950s audiotape was introduced, succeeded by audiocassettes from the 1960s. The 1980s started with the worst record sales slump since the 1930s, which was ended with the introduction of the compact disc, which started a new boom. In the late 1990s, MP-3 files supplied through the internet became increasingly popular, and in the 2000s, internet distribution was gradually becoming the standard. A myriad of smaller innovations, such as stereo-records, Dolby noise reduction and quadraphonic were introduced along the way.

Table 2.5: Key factors in the development of the British music industry, 1890-2008

	Technology	Industry structure	The U.S.	UK Policy
1890s	Gramophone / phonograph's main application becomes music	Gramophone Company Ltd. founded (becomes one of UK's and world's largest companies)		
1900s				
1910s				Deutsche Gramophone Gesellschaft's UK assets merged with those of Gramophone Company Gramophone Company manufactures precision military equipment
1920s	Radio provides both substitute and complement for records			
1930s	Jukeboxes	Enormous shrinking of record sales EMI formed through merger		
1940s	LP and EP introduced			Record firms manufacture precision military equipment; Decca has to divest important US subsidiary during war Decca develops submarine sounds training system, which later result in ffr-records (failed) Decca sells Dutch subsidiary to Philips, which eventually becomes PolyGram and buys Decca in 1979

1950s	Compatible joint LP/EP standard Audiotape Stereo	Pop music boom starts	EMI looses licensing contracts with CBS Records and RCA EMI buys Capitol Records	
1960s	Audiocassettes	Declining concentration	CBS and Warner set up their own international A&R and distribution networks – including in UK EMI successfully exports Beatles through Capitol	
1970s	Quadraphony (failed)	Paramount – EMI merger rebuffed by EMI, which merges with Thorn instead		
1980s	Compact disc DAT (failed)	Enormous shrinking of record sales Warner-PolyGram merger blocked Increasing concentration as majors buy up independents and labels	MCA Universal sets up its own foreign distribution and A&R network – including UK BMG (Germany) does the same Sony buys CBS Records	MMC inquiry into the supply of recorded music
1990s	DCC (failed) MiniDisc (mixed) MP3 files	EMI buys Virgin Music PolyGram – MCA / Universal Music merger		Start of DCMS 'creative industries' thinking
2000s	Internet distribution I-pods	Warner – EMI merger blocked Sony – BMG merger first blocked then approved	Slump in music sales	

POLICY

Compared to the film industry, direct policy intervention has been limited, and the sector has been successful without it. The only major interference took place during the wars, when Deutsche Gramophone Gesellschaft's British assets were merged with the Gramophone Company, record companies made military products, and Decca was forced to divest its US business. The role in the organising and then the adherence to the various international copyright conventions (such as the Berne convention of 1909) may have been of some importance for the UK music industry.

In the latter half of the twentieth century competition policy became of some importance. There were inquiries into how the large companies dominated record sales, whether there was enough competition, and some large mergers were blocked (Table 2.5).

Indirectly Government policy has been very important in providing music education and supporting many music institutions, such as concert halls, opera houses and music festivals. Private initiatives by charities and associations were also important. This 'policy' mattered over the decades if not centuries. It has made London an important, possibly the most important, music capital in the world. It is difficult for other countries to erode this distinct capability in less time.

THE IMPACT OF THE US MUSIC INDUSTRY ON BRITAIN

As in many creative industries, the United States was important given its large market size. Marginal costs are so low that the size of the market determines the sunk outlays record companies can incur on production and marketing, and that thus the US was important.

Until the 1950s the US was a significant supplier of repertoire to the UK market. EMI had licensing contracts with CBS Records and RCA. In the 1950s, it lost its CBS contract to the Dutch company PolyGram and its RCA contract to Decca. EMI then bought Capitol Records in the US, a successful and growing firm.

During the 1960s, Britain started to export lots of pop repertoire to the US and the rest of the world, prime examples being *the Beatles* and *the Rolling Stones*. At the same time, CBS Records, Warner Music and RCA set up international A&R and distribution networks, and opened UK subsidiaries to plug themselves into the UK talent market.

The 1980s saw two other new entrants on the international stage: MCA Universal of the US and BMG of Germany. A merger between Warner and the Dutch PolyGram was blocked by US authorities, while Sony bought CBS Records. In the 1990s, MCA Universal Music merged with PolyGram, and in the 2000s Warner Music attempted several times to merge with EMI, without success. Sony/CBS Music was eventually allowed to merge with BMG.

Industry structure and significant firms

Just as film, the music industry is vertically integrated through ownership and revenue-sharing contracts (Table 2.6). The distribution activity is key, and nowadays the main global record distributors (EMI, Universal Music, Sony/BMG, Warner) also finance A&R, often through partially owned labels. Unlike film, Britain's distinctive capability is high throughout the entire value chain, including a large home market with critical, knowledgeable, educated consumers who can serve as a test market for exportable repertoire.

Table 2.6: Stylised overview of the value chain of the UK music industry

	Creative inputs	Finance	'Production' (A&R/'labels')	Studios	Distribution	Retail (all channels; stores, RTV, internet)	Consumers
Scarcity	Intermediate	Intermediate	Intermediate	High > low	High > Intermediate	Intermediate > low	Low
UK distinctive Capability	Very high	High	High	High	High	High	High
UK ownership of activity within UK	High	Intermediate	Intermediate	High	Intermediate	High	High
Industrial concentration	Monopolistic competition	Low	High	Low	High	High > Intermediate	Low
Trade balance	Exports	–	Exports? ^a	Exports? ^a	Imports? ^a	– (exports if foreign tourists watch more than UK tourists)	
Regulation / policy	Skills infrastructure; music education Music subsidies			Public supply of some through BBC		Restriction of consumption times (e.g. Sunday openings) Public broadcasters	

^a As the import and export figures for music are not reported separately by the ONS the trade balances are unknown and the statements in the table are estimates.

Finance is important in the music industry, and London is full of talent managers, lawyers and entrepreneurs making deals about rights and royalties. Music publishing is also an important British activity, involving royalty collection. Many music publishers are owned by the record majors, but many are also independent. Recently a Dutch pension fund bought a UK music publisher because the long-run revenue stream of the copyrights it owned matched the pension companies long-run liabilities.³²

From early on the industry has been highly concentrated. The Gramophone Company and British Columbia dominated the British music market and merged to form EMI in 1931. Another significant firm was Decca, managed by a large shareholder and investment banker Edward Lewis. It was the only record firm to grow extremely fast during the 1930s and challenge the incumbents on both sides of the Atlantic. It offered records of leading stars at very low prices in very large quantities, and also adopted the juke box as a major new business model. Decca founded a successful US subsidiary, which it had to divest during the war.

Concentration fell considerably during the 1960s. Many smaller new firms entered, including the Robert Stigwood Organisation, which initially floated on the London Stock Exchange, but was then taken over by PolyGram, who created a series of joint-ventures with Robert Stigwood leading to multimedia successes such as *Saturday Night Fever* and *Grease*. A later new entrant was Virgin Music, which signed many

³² The main other assets with this characteristic are forests, in which pension funds and university endowments also happily invest. Harvard's investment fund, for example, employs three expert loggers.

new acts and formed an international organisation, before being bought by EMI in 1994. During the 1970s the trend of declining concentration was reversed again, when the surviving major record companies bought stakes in 'labels', smaller independent companies, that created the repertoire they could distribute.

Bakker (2006) argues that these companies adopted a rights-based organisational structure and characterises them as rights-based multinationals. Majors who did not make this switch (RCA in the US and Decca in Britain) disappeared as independent firms. The result was an increase in concentration without a decrease in the diversity of musical styles.

The survivors built a rights-based organisational model, by buying a network of dispersed record "labels" in important supplier countries that spotted and developed talent. These labels created revenue-generating assets in the form of copyrights, which were administered and exploited by in-house music publishers. The multinationals extracted the maximum profits from these rights by selling them through a distribution organisation. By the end of the twentieth century, six of these rights-based multinationals dominated the industry: Bertelsmann Music Group (BMG), Columbia/Sony Music, Electric & Musical Industries (EMI), MCA Records, PolyGram, and Warner Music.³³

Because of the shift of ownership to these rights-based multinationals, mergers and acquisitions were important in the evolution of the music industry since the 1950s. British strength in finance could provide expert advice and services for those mergers. Tables 2.7 and 2.8 show the most important mergers that led to the formation of the six (now four) rights-based multinationals.

33 In several other industries, such as pharmaceuticals, motion pictures, and software, rights-based multinationals have also emerged. These industries are typically engaged in the constant launching of innovations on which the firms hold temporary monopoly rights. Because they are used in different products and formats, the rights themselves are the main revenue-generating assets. The profitability of each right is uncertain. Though most revenue is earned shortly after the launch of a new product, the life cycle of a right could be extensive – over a hundred years in the case of copyright. Therefore, firms diversify risk by investing in portfolios of rights, so that hits compensate for misses and multiple market segments are covered. Because this strategy involves large fixed and sunk investments in R&D, marginal revenues largely equal profits, giving rights-based multinationals an incentive to exploit their rights worldwide. In order to guarantee market access and to maximize the benefits derived from their rights, rights-based multinationals need to own delivery systems in all major product markets.

After 1945, more and more markets for rights-based products reached a size that was sufficient to warrant direct distribution. The resulting global-distribution organizations generated essential market knowledge and required a minimum level of sales and product variety to break even. To create portfolios of new rights, the multinationals managed a federation of unevenly dispersed, flexibly specialized R&D units, each with a maximum efficient size and number of specializations.

These units had local roots but produced for a global market. They had organized themselves so as to succeed in a competitive environment and were only acquired after they had survived on their own. Each R&D-unit linked the multinational to a network of regions and genres, supplying it with information about the potential market for final products and the value of creative or technical products and potential acquisitions. Only the federated form (F-form) could ensure that multinationals assimilated idiosyncratic R&D units into an international federation and linked them to a more homogenous global distribution organization. This tactic allowed a jump in firm size previously considered impossible in these industries. Without the F-form, folding acquired R&D units into a unified structure might have undermined their value, as accountants and managers might have been tempted to rationalize a centralized R&D organization.

The pharmaceutical industry, for example, has partially adopted the F-form, and corporations in several other businesses have decentralized their R&D in order to link it to local knowledge networks. It may not be a coincidence that every large merger of pharmaceutical firms since 1945 has led to a decline in value of the merged company, whereas the multinationals' cooperation with small biotech firms has proved to be highly profitable. The rights-based, federated structure of multinational organization pioneered in the music industry might offer an insight into the evolution of multinational enterprise in other industries facing similar challenges (Bakker 2006).

Table 2.7: Major Mergers and Acquisitions in the Music Industry, 1929–2005^a

Year	Buyer	Target	Share (%)	Real value (\$million) ^b
1929	RCA	Victor Talking Machine Co.	100	1,287
1931	Columbia U.K.	Gramophone Company	Merger ^c	n/a
1950/62/72	PPI ^d	Deutsche Grammophon	Merger	n/a
1962	MCA	Decca Records, Inc. ^{e,f}	Merger	n/a
1966	Kinney Corporation	Warner Brothers ^f	100	1,443
1979	Thorn	EMI Ltd. ^{f,g}	100	706
1986	Bertelsmann	RCA Records	100	463
1987	Sony	CBS Records	100	2,732
1989	PolyGram	A&M Records	100	586
1989	PolyGram	Island Records	100	568
1989	Investors–IPO	PolyGram ^f	20	400
1989	EMI	SBK Publishing	100	429
1990	Time-Life	Warner Communications ^f	100	17,159
1990	MCA	Geffen Records	100	662
1990	Matsushita	MCA Universal ^f	100	7,513
1992	EMI	Virgin Music	100	1,108
1995	Seagram	MCA Universal ^f	80	6,188
1998	Seagram	PolyGram ^f	100	11,035
2002	BMG ^h	Zomba Records	75	2,636
2003	BMG	Sony Music	Merger	n/a
2003	Edgar Bronfman c.s.	Warner Music	100	2,618
2005	Investors–IPO	Warner Music	20	508

Sources: PolyGram Archives, trade press, business press, literature on industry; see also Bakker (2006).

^a Deals with a value of more than c. \$400 million are included.

^b All values are real values in millions of constant dollars for the year 2000 (GDP-deflated).

^c The merged company was called Electric & Musical Industries (EMI).

^d PPI = Philips Phonographische Industrie NV. After the ownership merger in 1962 the combined PPI-Deutsche Grammophon was named the Grammophon-Philips Group. After the operational merger in 1972 it was named PolyGram.

^e Decca Records, Inc. merged with Universal-International Pictures in 1952.

^f The target includes film and/or television divisions.

^g Was preceded by a failed bid of Paramount Pictures of \$299 million for 50 percent of EMI Ltd.

^h BMG = Bertelsmann Music Group.

Table 2.8: Various Medium-Sized Acquisitions by Multinationals in the Music Industry, 1920–2004

Year	Buyer	Target	Share (%)	Real value (\$million) ^b
Before 1960				
1920	Victor Talking Machine Co.	Gramophone Company	47	63
1924	Columbia U.K.	American Columbia	100	21
1925	Columbia U.K.	Carl Lindstrom	100	
1927	Columbia U.K.	Pathé Frères	100	
1932	Decca Ltd.	Brunswick Records	100	
1933	American Record Company	American Columbia	100	1
1938	CBS	Columbia	100	7
1955/61	EMI Ltd.	Capitol	100	92
1957	Paramount	DOT Records	100	10
1960s				
1962	PolyGram	Mercury Records	100	9
1963	Warner	Reprise	100	55
1966	ABC Records	Dunhill Records	100	13
1967	Warner	Atlantic	100	82
1967	Warner	Ashley Famous Agency	100	42
1967	PolyGram	RSO	100	33
1968	PolyGram	Chappell	100	171
1969	ATV	Northern Songs	100	91
1969	GRT ^b	Chess Records	100	31
1970s				
1970	Warner	Elektra	100	36
1971	Warner	Asylum	100	24
1972	CBS Records	Stax	100	23
1972	PolyGram	MGM Records (including Verve)	100	n/a
1972	PolyGram	United Distribution Corp.	100	n/a
1976	EMI Ltd.	Screen Gems Music Publishing	100	58
1977/80	PolyGram	Casablanca Film and Records Works	100	51
1979	MCA	ABC Records	100	81
1979	Bertelsmann	Arista Records	100	101
1979	EMI Ltd.	United Artists Records	100	6
1979	PolyGram	Decca Ltd.	100	60

1980s				
1983	RCA	Arista	50	n/a
1984	ATV	Majority of copyrights to Beatles songs	100	103
1986	PolyGram	Dick James Music	100	56
1986	SBK Entertainment	Music publishing of CBS Records	100	175
1986	MCA	Front Line Management/Full Moon Records	100	22
1987	Warner	Chappell	100	383
1987/97	PolyGram	Go! Discs	100	36
1988	MCA	Motown Records	20	81
1989	Sony	Tree International	100	53
1989	Warner	Birch Tree	100	32
1989	Fujisankei	Virgin Records	25	240
1989	PolyGram	Welk	100	32
1989	PolyGram	Polar + Sweden Music	100	32
1989/91	EMI	Chrysalis Records	100	179
1990s				
1990	Warner	CBS Record Club	50	382
1990	EMI	Filmtrax Catalogue	100	141
1991	PolyGram	Really Useful Holdings	100	199
1991	PolyGram	CD factories Hannover/Louviers	100	108
1992	Carlton Communications	Pickwick Records	100	145
1992/96	Sony	Creation Records	49	30
1993	PolyGram	Nippon PhonoGram	35 ^c	26
1993	PolyGram	Motown Records	100	341
1994	Sony	ATV Music	100	116
1994	Warner	CPP/Belwin	100	23
1994	BMG	Riccardi	73	332
1994	EMI	Intercord	100	95
1994/97	PolyGram	Def Jam	100	139
1995	PolyGram	Rodven Records	100	62
1996	MCA	Interscope Records	50	213
1996	BMG	Fun House	100	96
1997/04	EMI	Jobete ^d	100	316
1999	EMI	Fuji-Pacific Music Inc. ^e	100	204
2000s				
2000	Universal Music	Rondor Music	100	350
2000	BMG	Napster	100	60
2003	Universal Music	Dreamworks Records	100	95
2004	JDS Capital	Dreamworks Music Publishing	100	42

Sources: PolyGram Archives, trade press, business press, literature on industry.

^a Real value is in millions of constant dollars of the year 2000 (GDP-deflated).

^b GRT was a manufacturer of audio tape and cartridges.

^c The 35 percent PolyGram did not already own.

^d The firm owns copyrights to Motown songs; EMI acquired 50 percent in 1997, 30 percent in 2003, and 20 percent in 2004.

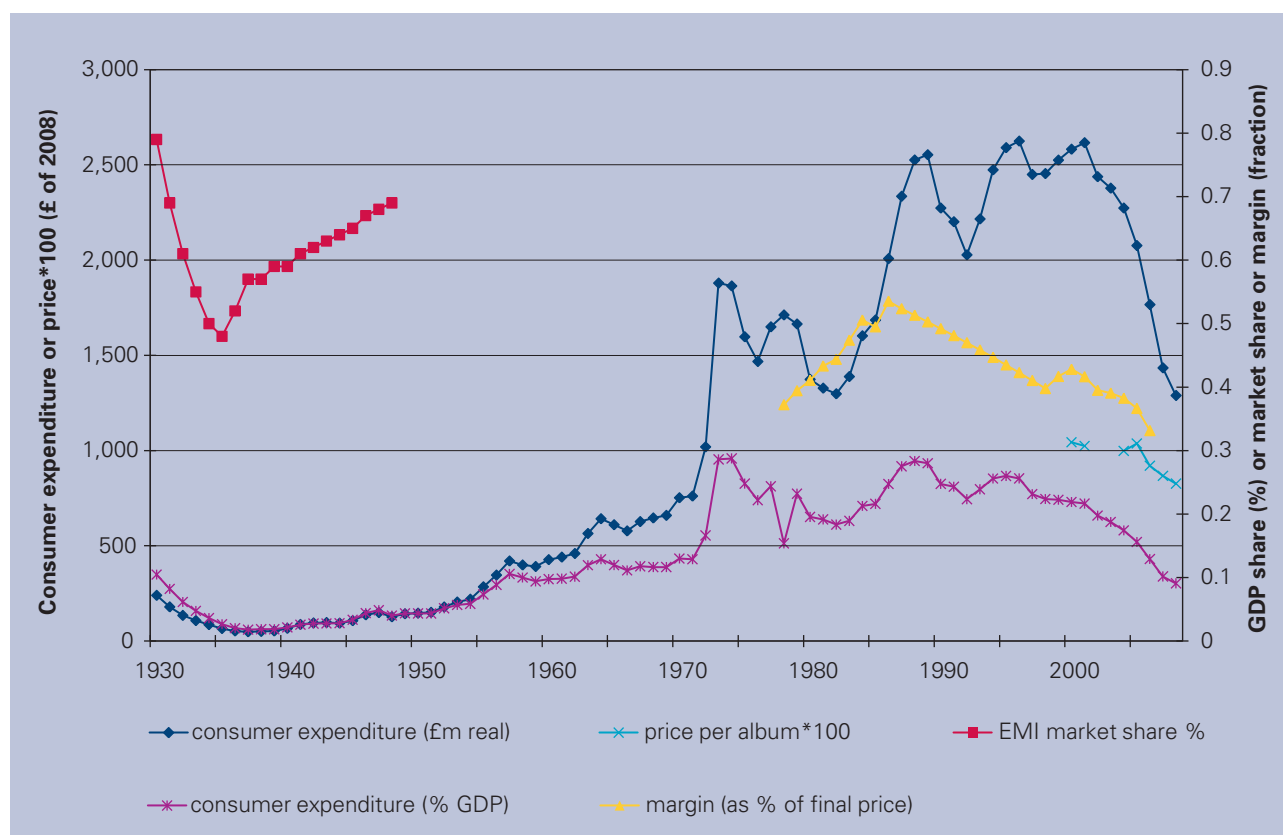
^e EMI acquired the rights to 40,000 songs of Fuji-Pacific Inc.

Only one of these multinationals is British. One could argue that, just as in film, as long as the London creative industrial district remains alive and kicking, any multinationals or new entrants will have to invest in the UK. Little danger exists that they will switch their investments to low-cost markets, as, for example, in (car) manufacturing.

IMPACT

The music industry's GDP-share has been low, far lower than that of film. It was about 0.1 per cent of GDP in 1930, and then sank to 0.02 per cent during the depression years (Figure 2.11). By the late 1950s it had reached 0.1 per cent again, and during the early 1970s it reached an all-time high of 0.29 per cent of GDP. It then declined to about 0.18 per cent during the 1980s depression, but was pushed up again by the advent of the CD, reaching 0.28 per cent in 1987. Nowadays its share at retail value is again around 0.10 per cent. In part this might reflect a sharp jump in TFP in the industry because of the adoption of digital downloads. In 2008, 12.7 per cent of retail music sales by value was downloaded, and distribution and manufacturing costs are considerably less for digital downloads. However, efficiency gains are constrained by the extent to which costs in physical distribution systems are fixed. Yet, the average annual real price decline of 9.8 per cent a year since 2001 shows that efficiency gains have been realised, whether through lower costs or lower margins.

Figure 2.11: Consumer expenditure on music, in real pounds and as share of GDP, EMI's market share and average album prices, 1930-2008



Note: consumer expenditure for the years 1988 to 1997 is estimated based on trade deliveries using the relationship of the latter with consumer expenditure for the years 1978-1986 and 1998-2006. The two series are also used to estimate the gross margin in music retailing. This is no more than a rough estimate. Sources: EMI Archives; British Phonographic Industry Association; Entertainment Retailers Association, Yearbooks.

If we value the time people spend listening to music, its welfare impact may be several times higher than its GDP-impact, although probably less than for film, as listeners can perform other tasks.

Export and import figures for music have not been collected separately. However the Performing Rights Society data on royalty exports shows a rise from £68 million in 1999 (£84 million in today's money) to £140 million today, a real annual growth of 5.8 percent. We do not know whether there was a concomitant rise in royalty imports.

What is the economic argument for intervention in film but not in music?

The question remains what the market failure rationale was for the UK Government to intervene in film but not in music. In the preceding section the benefits and costs for intervention in film have been discussed. Here we will examine why similar arguments do not imply intervention in music. We will first discuss the purely economic reasons and then three historical factors that further reinforced a non-intervention policy. As an aside, we should note that outside recorded music itself, Government intervention in music has always been large, in the form of, for example, music education and subsidies for music performances. Likewise the role of semi-public organisations and charities has always been large.

Five main economic arguments can be made as to why there was less of a reason for intervention in the recorded music industry. First, consumers' preferences for music are more horizontal and focused on variety, than vertical. This appears to hold within and across genres. A classical music lover, for example, is unlikely to switch to rap music, no matter how much the rap label spends on quality improvements and marketing. Second, the mirror image in music production is that the schedule linking perceived quality improvements to sunk expenditures is extremely flat, meaning that it is extremely – if not infinitely – costly for music producers to increase quality by spending more. While one can increase the perceived quality of a film by doubling the budget from £50 to £100 million, it appears difficult to increase the perceived quality of a song in the same way, by doubling sunk expenditures (after a minimum, exogenous level of sunk expenditure has been reached).³⁴

Third, entry costs in music production are low. This is partly because sunk costs were more exogenous than endogenous and at a limited level, but also because the contractual structure meant that most inputs were paid from revenues (royalties) rather than through upfront sunk expenditures.

Fourth, entry costs in music distribution appear to have been lower than in film. Distribution capacity was less scarce as no dedicated distribution delivery mechanism (e.g. a cinema) was needed to sell the product. Also, marketing expenditure could be more spread out (and thus less easily wasted on flops) because not everyone needed to buy the product in a specific cinema release time-window. Unlike in film, where the twentieth century only saw a long list of unsuccessful entry attempts, the history of the music industry is almost defined by new entry. In the 1930s Decca was a big new entrant, in the 1950s Philips and Deutsche Gramophon Gesellschaft (who would form

³⁴ The main other assets with this characteristic are forests, in which pension funds and university endowments also happily invest. Harvard's investment fund, for example, employs three expert loggers.

PolyGram), in the 1960s Warner Music, in the 1970s MCA Universal and Virgin Music, and in the 1980s Bertelsmann Music Group. Even nowadays, new firms enter international music distribution, such as Apple when it launched its iTunes service.

Fifth, technologically, international trade in music often had less effect on consumer utility. Many American songs could be exported as composition and lyrics which would be performed by a local artist, without the public having to recognise the song as foreign. This was a widespread practice in the UK before 1960. This also meant that a lot of the value added was captured in Britain. The mirror image of this point may be that some music may be culturally more specific than film, and therefore sometimes less easy to export.

These five factors suggest that for a 'small' country it was still possible to compete in music, while it was difficult to compete in film. Three historical factors further diminished the case for intervention. First of all, British film production almost totally ceased in the mid-1920s, suggesting that without intervention, few films would be produced by the private sector. A situation where no music was made in Britain never existed. Second, EMI Ltd., a British firm, held an extremely large market share of between 50 and 80 percent during the 1930s, meaning that there was less reason to be worried about the effect of remitted profits on the balance of payments, while politically there seems to have been little energy to start competition investigations involving a successful British firm. Third, in the 1920s, radio became an important medium for distributing music, and the distribution here was controlled by a semi-public monopoly, the BBC. The latter two aspects imply that the absence of concern about competition and (competition) policy intervention where no foreign firms were involved might have been costly. A counterfactual situation with several more music distributors and broadcasters might have increased both welfare and GDP.³⁵

LESSONS

1. The music industry appears to have done well in the long-term, without much direct policy intervention.
2. Indirectly the music industry was supported by a very long-run UK supply side 'policy' of supporting music education, music institutions and importing top musical talent from around the globe. A substantial part of this support was given by charities and non-Government public sector organisations.
3. Britain's strength in music links to the country's other distinctive capabilities in project-based industries, such as finance, lawyers, broadcasting, film production and videogames.

35 To some extent, EMI was disciplined by entry threats in its product market, such as the successful entry of Decca Records in the 1930s (entry threats that had become largely absent for the Hollywood studios since 1927). The BBC, by its very nature, faced no such threats.

4. Competition policy could probably have been more proactive. At the time of Decca's US and other international divestments, EMI's market share was approaching 70 percent, declining substantially only during the 1960s. The question remains whether a more active competition policy in the 1940s and 1950s, or a Decca that kept its international assets, might have led to an even stronger UK music industry later on.

2.5 The evolution of the British videogame industry

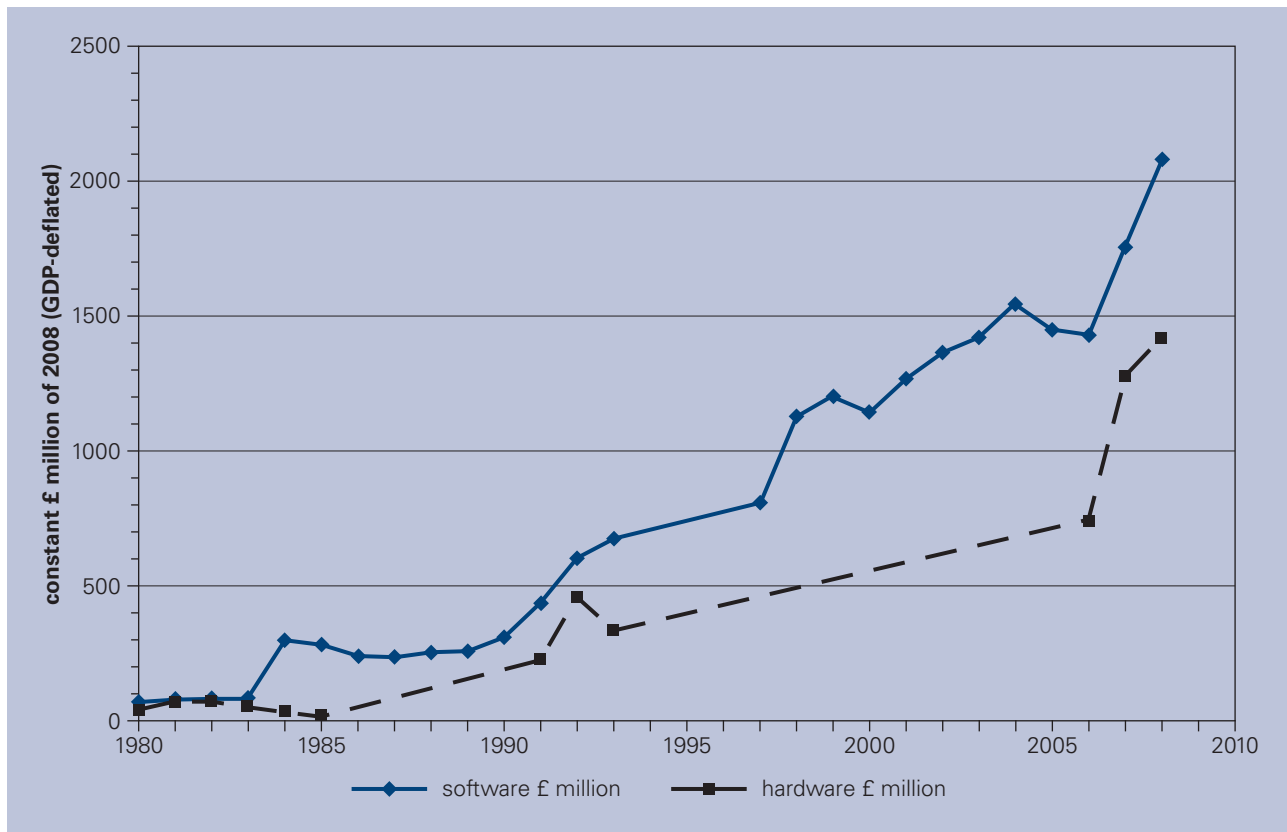
THE INDUSTRY TODAY³⁶

In 2008, the UK videogame sector had 155 companies specialised in developing games, 30 games publishers/distributors and 35 games support companies (Skillset 2008). Employment in games development was about 8,850 and turnover was about £625 million, or 0.04 percent of GDP (Skillset, Oxford Economics 2008).

In retail, 88 million software units were sold, both for dedicated consoles and PCs, with a total value of £2,082 million. 9.3 million game consoles were sold, with a total value of £1,422 million. Together this amounts to a quarter percent (1/400) of GDP. In 2008, 1,742 unique software titles were available for sale, with an average sale per title of £1.2 million, although actual sales fluctuated sharply between titles, with a few hits accounting for a large share of sales. The average price of a game was £23.71, the average price for a console was £153 (Entertainment Retailers Association 2008).

Since 1980, when the industry had existed for only a few years, sales of videogame software and hardware has grown phenomenally in Britain, from £119 million in today's money in 1980 to £3,504 million today, an average annual real growth of 12.8 percent (figure 2.12). Software alone grew at a similar rate, from £73m to £2.1bn. However, the growth was subject to sharp fluctuations. The console-cycle was an important cause, which each new generation of platforms leading to an upturn in hardware and software sales.

36 The author is grateful for suggestions and comments from Christopher Louis Colvin, Jonathan Sapsed and Peter Sims'

Figure 2.12: Real British videogame hardware and software retail sales, 1980-2008

Note: official ONS time series do not exist for this industry. The figure therefore only gives a rough indication. Data before 1995 is based on various market research reports used by the Monopoly and Mergers Commission (1995); 1983 data may not be comparable to 1984 data. Data since 1998 is from the Entertainment Retailers Association Statistical Yearbook (2009) and appears more reliable and internally comparable.

EVOLUTION OF THE INDUSTRY

The evolution of the global industry can be characterised as taking place in a number of phases. The first computer game was Spacewar! developed in 1961 at MIT to showcase and diagnose the capability of computer systems. During the early 1970s some arcade games emerged, in which hardware and software were fixed in one system.

The development of the home videogame market was led by Atari (owned by the film studio Warner Brothers), who in 1975 launched Pong, a single-console home version of the arcade game. The next year Atari introduced the Atari 2600, a programmable computer that used interchangeable cartridges, which also came to be used by competitors. The videogame market grew by about 50 percent per year until 1983, when US sales quickly imploded from \$3 billion to \$100 million.

The introduction of a new 8-bit system in 1985 helped revive the global industry. Through the cartridges, Nintendo tightly controlled the software developers, only allowing high quality games and arguably capturing most of the value of the software developers. Quickly Nintendo controlled over half the market until, in 1989, an arcade company, Sega, introduced the 16-bit Mega Drive system and went into direct competition with Nintendo. For some years Nintendo and Sega were fighting each other within a near-duopoly until Sony launched the PlayStation in 1995, a platform

based on CD-roms rather than cartridges.³⁷ Quickly PlayStation became the dominant format, until in the early 2000s Microsoft launched the competing XBox. Later, in 2006, Nintendo launched the Wii, a machine aimed at a wider market and entire families.

Schumpeterian competition

In short, the history of the technology relating to the hardware of videogames can be characterised by strongly Schumpeterian competition. One single firm generally is first to successfully market a new platform, get a very high market share, often above 50 per cent of sales, and enjoys a temporary close-to-monopoly position. However, the lucrative market quickly attracts new entrants, who often are able to design new hardware with new features, because they are not locked-in to the existing standard. Today the market appears unusually competitive, with three major platforms fighting each other.

Besides the dedicated game machines, a parallel market for PC-games has existed since the early 1980s, initially mainly for the IBM-compatible PCs and the Commodore Amiga. In the late 1990s, another parallel market developed for online games and nowadays many cartridge games can be extended to online use.

As the MMC³⁸ argued in 1995, the relevance for software developers (and this is the main British interest) was that hardware makers, through the cartridge systems, potentially were able to capture their value and control them, a situation that has been mitigated since 2000 with the three alternative platforms, cheap smartphone games and online subscription-based gaming.

Table 2.9: Key factors in the development of the British videogame industry, 1960-2008

	Technology	Industry structure	The U.S./Japan	UK Policy
1960s	First game Spacewar! (MIT, 1961)			
1970s	First arcade games First single-game consoles First split console/cartridges systems (Atari)	1978 implosion of market		
1980s	Nintendo resuscitates market with new machine, gets 84 % market share	1984 implosion of market (e.g. US from \$3billion to \$100 million)		
1990s	1995: Sony launches PlayStation		Major US publisher	1995 MMC inquiry videogame courses at universities
2000s	Rise of online games	Microsoft launches XboX Nintendo launches Wii		R&D tax credits introduced, benefiting innovative industries such as the videogames sector

37 Several earlier attempts failed such as the ones by Panasonic and 3DO to establish an open standard as in many consumer electronics industries, and one by Atari.

38 MMC (1995).

POLICY

Policy influences have been primarily horizontal

There has been limited direct Government subsidy aimed at assisting the development of videogames in the UK particularly when compared to other creative industries.

During 2009, the industry association of independent game developers³⁹ formally submitted to the Treasury arguments for the creation of an estimated £192 million tax relief for the industry over five years, for the production of 'culturally British videogames'. In the 2009 Pre-Budget Report the Chancellor announced that the Government is not currently persuaded that the evidence is sufficiently compelling to justify the introduction of a tax incentive for the development of culturally British videogames.

However, on 24 March 2010, in the new budget, the Government reversed its position and announced plans to introduce tax relief for game developers. "I will offer help to the computer games sector, similar to the steps which are helping restore the fortunes of the British film industry," the Chancellor told MPs in his budget speech. "This is a highly successful industry, with half its sales coming from exports, and we need to keep British talent in this country." To apply for tax credits, game companies will need to pass a British cultural test (which will need to be approved by the European Commission).

Broader Government policy has clearly impacted on the development of the industry, particular in the area of competition policy, education, R&D tax credits and international trade policy.

Competition and regulatory policy

Because of the Schumpeterian competition discussed above and because of the impact of the cartridge system on the software sector, competition policy is important. The Monopoly and Mergers Commission (1995) conducted a detailed review of the videogames sector and concluded that the market was dominated by the Sega/Nintendo duopoly (having 67 per cent of software sales) and that their licensing conditions to developers and their in-house cartridge manufacturing kept prices artificially high. It recommended a number of compulsory changes in the licenses between Nintendo/Sega and the developers, but noted it was restricted by EU regulation. Ironically, as the MMC report was published, Sony launched its PlayStation that would sweep away the Nintendo/Sega duopoly. In this sense it could be argued that by exclusively focusing on (short-run) allocative efficiency, the MMC forgot to closely study the (long-run) dynamic efficiency of the sector. Competition policy may not have been entirely up-to-speed with the dynamics of high-technology markets. In this area the Competition Commission could arguably learn from its US counterpart.⁴⁰

³⁹ Financial Times, 10 December 2009, p11.

⁴⁰ See the last section.

We should also note, in terms of broader regulatory policy, that Government has resisted calls from those outside the industry seeking to introduce new restrictions on the production and sale of certain types of video games content.

Education and skills

Education is an important area of policy. Skillset suggests there are now more than 80 videogames design related Higher Education courses in the UK. But many UK firms prefer to draw on the university system through recruiting fewer specialist Science, Technology, Engineering and Mathematics (STEM) graduates (particularly) mathematicians, physicists and computer scientists or people from the top-art schools. and then to further train them in-house. Both the industry, including through the sector skills council Skillset have been critical of specialist provision (although nine course have received their accreditation), suggesting the best schools are generally in Germany and France.

Looking forwards, in December 2009 the Government announced a £3.5 million grant towards facilities and prototyping support at two centres of excellence for the games industry in Dundee and Manchester complementing funding from the European Regional Development Fund and North West Development Agency that will bring total investment in the centres to more than £10m The projects aim to address issues around access to finance and also to increase the supply of 'industry-ready' workers by deploying groups of students to work with small firms on prototype creation.⁴¹

R&D AND INNOVATION SUPPORT

The games development sector is quite R&D intensive, sinking about 14 per cent of turnover into R&D (Oxford Economics 2008), and many firms have made use of R&D tax credits, since their introduction for SMEs in 2000 and extension to large firms in 2002.

More recently, the Engineering and Physical Sciences Research Council announced £6m to support PhDs at videogames and animation centres at the universities of Bournemouth and Bath.

International trade policy

International trade policy is also relevant as British industry receives a lot of competition from firms abroad supported by generous tax breaks. Because videogames can be defined as cultural products, and because cultural products have been exempted from the WTO since 2005, intervention in this area is difficult. Some Canadian provinces have extremely generous, multiple tax breaks for the videogame sector, and France has also introduced tax breaks. The UK position in the international industry has slipped in recent years, from 3rd after the US and Japan to 5th, being overtaken by Korea and Canada.⁴²

⁴¹ HMT (2009).

⁴² However these figures should be interpreted with caution as they can be largely influenced by the release of individual games and therefore have a degree of fluctuation between different years. The UK only made 3rd place in 2007 due to the success of a single hugely successful game. Longer term measures may indicate a more stable placing for the UK industry in these rankings.

THE IMPACT OF THE AMERICAN AND JAPANESE INDUSTRY ON BRITAIN

The American and Japanese industries have historically been important in developing consoles, and these are important for the development of the software market. UK firms depend on what hardware is developed elsewhere. They are held hostage to fortune, in the sense of whether these hardware markets will be competitive and will allow them to make profits on the software and whether they will be able to prevent most profits being captured by the hardware makers.

On the software side, all major game publisher-distributors are now Japanese or American. The last big UK international publisher was Eidos, which was taken over by a Japanese firm recently.

The Japanese market for videogames is at present of limited relevance for British developers as it is quite closed to foreign games. The US market is far more important as it is the largest in the world and relatively open.

Japanese and US firms are also vertically integrating British developers. Warner Brothers, for example, which pioneered computer games in the 1970s through its Atari subsidiary, bought TT Games in Manchester and also owns stakes in several other UK developers.

INDUSTRY STRUCTURE

Industry emergence in the US, Britain and Japan

In the US, videogames had their origins in university labs, the personal computer industry and arcade games. In Japan, the videogame industry evolved out of arcade games, toys, consumer electronics, comics and animation film sectors (Izushi and Aoyama 2006). In the UK, videogame development emerged rather late and started with 'bedroom programmers' writing programmes for home PCs such as the Sinclair ZX Spectrum and the Commodore 64. Interestingly, there are no links between the UK animation sector and the UK videogames industry, which some attribute to the heavily subsidised non-profit cultural elite character of much of the UK animation film sector (Izushi and Aoyama 2006). With the exception of Aardman's films, many (short) British animation films are highly successful at international festivals but not commercially viable.

Vertical integration

The industry is vertically integrated like the music and film industry, with the distributors (named 'publishers' in this sector) again dominating the industry, as they can advance cash to the developers and guarantee a minimum level of sales.

The industry has become slightly concentrated in the distribution part (sometimes extending into development when distributors buy stakes in developers). The four-firm concentration ratio in the world-wide market for console games, for example, was 52 percent, with market leader Electronics Arts (US) having 19 percent, Sony

(Japan) 14 percent, Nintendo (Japan) 11 percent, and Activision 7 percent. Of the 16 largest world-wide publishers in that year, only three were also important console manufacturers (one of which is Microsoft (US) with a 2 percent software market share (Teipen 2008: 316)).

A big issue is whether the console makers, the game developers or the distributors capture the value. Unlike the film and music industry, creative inputs, although often highly paid, do not seem to be able to extract value. Star programmers or program makers/designers who command fees comparable to star actors, writers or musicians do not exist. The main creative inputs who can capture the value of videogames are those star inputs from other industries that license their image and likeness or their creative outputs to videogames.

Business models

Various different business models have been tried in the industry. The Nintendo-model of controlling software development through cartridge manufacturing has been widely adopted as it:

- prevents piracy
- allows quality control of titles
- allows control of the number of titles available
- allows value capture through manufacturing the cartridge for the software developer
- allows price control.

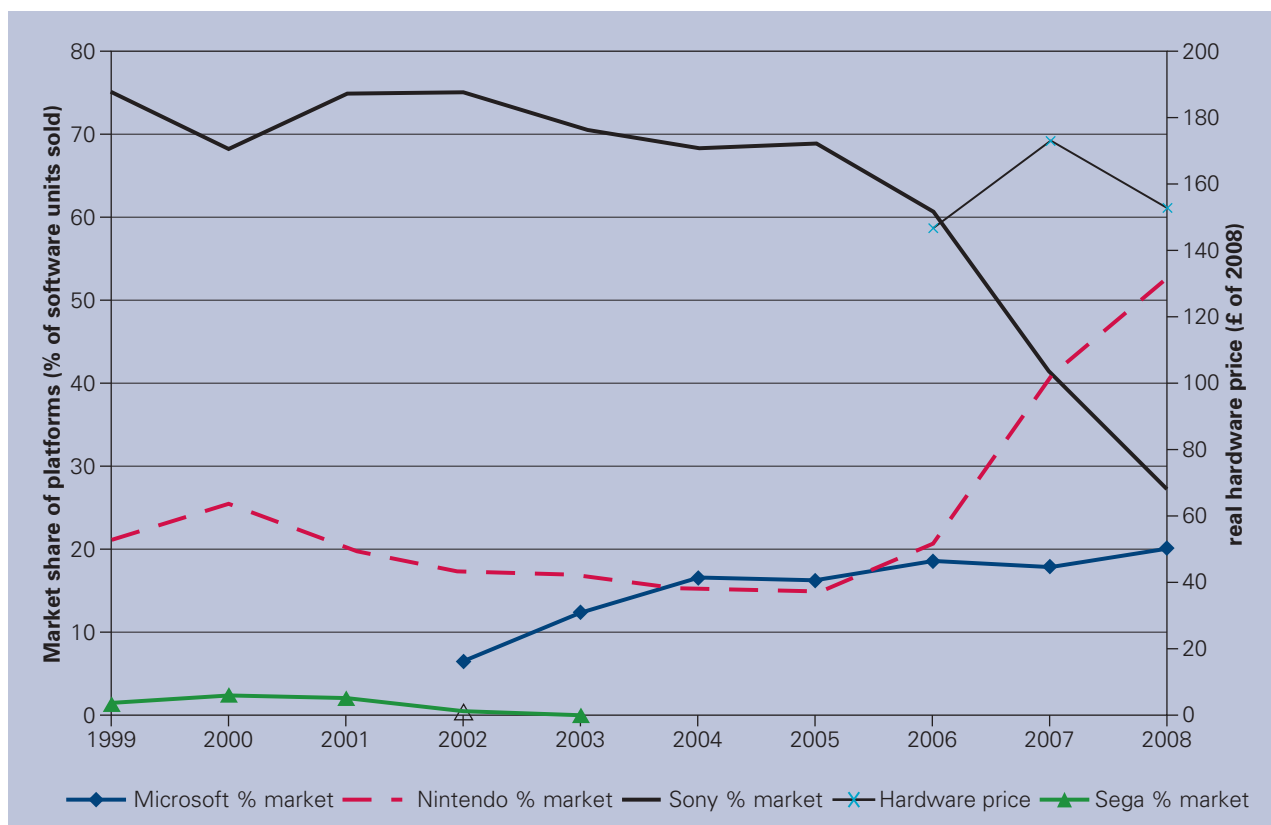
In the early 1990s, Electronic Arts, the largest publisher, tried to break this system with 3DO, which was modelled on consumer electronics standards, which are usually widely licensed. The idea was that any manufacturer could license this open standard, and any developer could write software for it. Yet the standard failed to take off, despite the backing of Matsushita, the world's largest consumer electronics company. The CD-rom system used by Sony PlayStation is a mix between the two, because it is easy to manufacture, easier to pirate, but still partially proprietary. An alternative business model is online gaming, which does not require specialist hardware and often make profit through a steady flow of subscription fees, creating virtual worlds in which players can game with each other. Many cartridge games now provide multi-player online options.

Given that the industry is highly dynamic, it does not seem to have settled down on a definite business model yet, and things can still change substantially in the next few years.

The importance of the platforms

On the technological side, three systems have dominated the industry for the last five years, Sony PlayStation, Nintendo Wii and Microsoft's Xbox. As can be seen from Figure 2.13, the sales of software for these systems shows sharp changes. At the time of the Mergers & Monopolies Commission inquiry, Nintendo and Sega almost divided the market between them, and as the report was printed Sony PlayStation was launched in the market and became the dominant platform, sweeping away Nintendo and Sega. Microsoft's entry in 2001 somewhat challenged Sony's dominant role, and Nintendo's Wii upset the industry structure by rapidly taking over the lead role from Sony. That this can happen in just two years suggests that the games-platform market is dynamically very efficient, even if it is not allocatively or productively (i.e. statically) efficient. It seems that dominant firms are constantly under threat from countermoves by other incumbent firms, by new entry, and by entirely different technologies, such as online gaming.

Figure 2.13: Software sales of videogames for the various console systems, as share of total videogame cartridge sales



Source: Entertainment Retailers Association, Yearbooks.

Static and dynamic efficiency (prices and new products)

Real console prices fluctuated substantially over the last three years, increasing by 2 percent a year on average (figure 2.14). Software prices also fluctuated sharply, but remained in a constant band, increasing by only 1.15 per cent per annum in real terms. To the extent that consumers would spend more time playing games, the price per hour might actually have decreased. Nevertheless, it is clear that neither the head-on competition in platforms, nor the monopolistic competition in games, has resulted in sharp price cuts or price competition that would get prices close to marginal costs.

So although there is substantial dynamic competition, in firms trying to sweep away competitors by introducing new products, static competition/efficiency seems to be far less. For platforms the reason might be entry costs and minimum-efficient sales levels; for games the monopolistic competition aspect, with each game having a niche to some extent, the degree of differentiation determining the pricing power.

The number of titles has increased since 2004, by 1.7 percent per year on average, while sales per title increased in real terms from £0.9 to £1.2 million, or 7 percent per annum (Figure 2.14). The explanation is probably the mechanism that prices drive costs in the creative industries. As the potential market increases because of a trend price increase of 1.2 percent per annum, and sales/titles increase, firms have an incentive to release more titles or spend more money on each title to increase its perceived quality and thus consumers' willingness to pay.

Figure 2.14: Number of videogames released, real prices and real sales revenue per title, 2000-2008

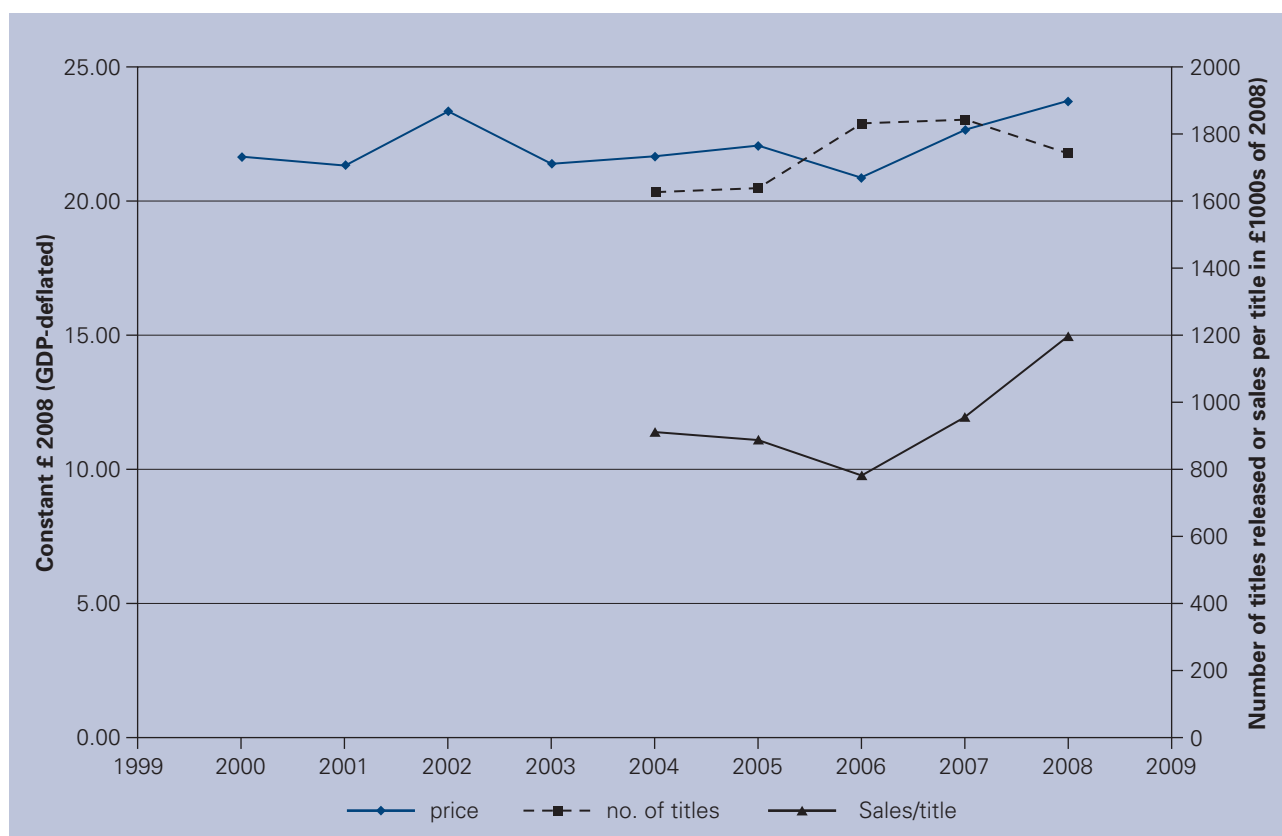


Table 2.10: Stylised overview of the value chain of the UK videogame industry

	Creative inputs	Finance	Production	Studios	Distribution	Retail	Consumers
	Scientists Artists Designers/ writers External IP (films, comics)		Development	Integrated with development	publishers	Stores, online, post-order	Gamers
Scarcity	Intermediate	High	Low	Low	High	Intermediate	Low
UK distinctive Capability	High	High	High	High	Low	Low	High
UK ownership of activity within UK	High	Intermediate	Intermediate	Intermediate	Low	High	High
Industrial concentration	Monopolistic competition	Intermediate	Low	Low	High	High	Low
Trade balance		–		Exports? ^a	Imports? ^a	–	
Regulation / policy			R&D tax credits				

^a As the import and export figures for videogames are not reported separately by the ONS, the trade balances are unknown and the statements in the table are estimates.

THE ROLE OF SIGNIFICANT FIRMS

As noted above, the industry is dominated by a few publishers. The combined market share of the five largest publishers is somewhat smaller than that of the five large Hollywood studios or the four large record multinationals, and the publishers also appear less symmetrical than their counterparts in film and music. The top firm, Electronic Arts, for example, focuses only on publishing, while two other top-firms also make hardware. Also EA's market share is far higher than anyone else's, and the market share of the top three is in a different league to the rest. This lower degree of concentration and the asymmetry could in theory mean that there is more competition in this sector (both static and dynamic) than in film and music.

THE VIDEOGAME INDUSTRY'S IMPACT

Challenges in data collection and availability

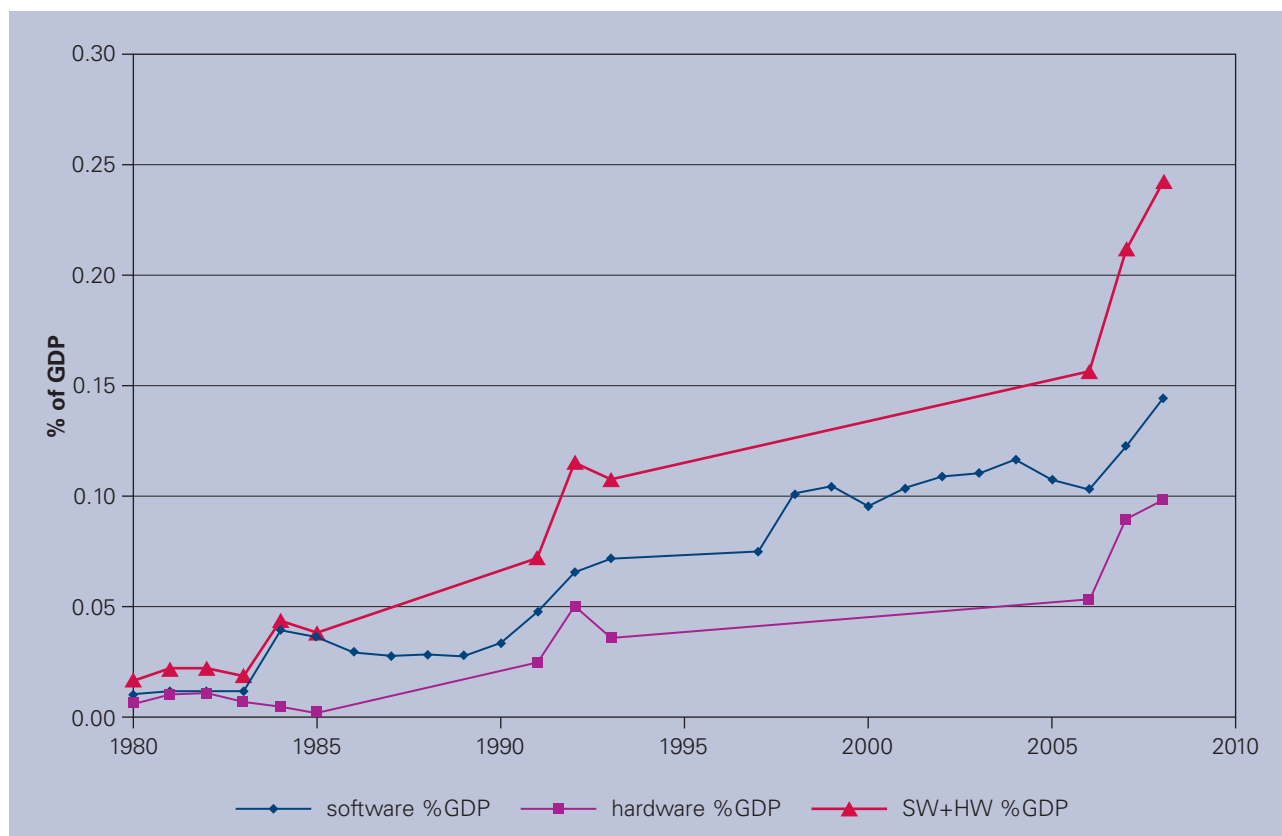
Reliable historical data for the videogame industry are difficult to come by for a number of reasons: data collection issues and inherent challenges in measuring creative industry output; no systematic data exists; there is no specific SIC code; and the main data available is from market research consultancies and trade associations. The Monopolies & Mergers Commission report (1995), for example, used time series data since 1980 from two market research firms. Therefore any available data should be seen as a rough indication only and both levels and growth rates might be subject to a substantial degree of error.

Inherent challenges for measuring industry output are royalty streams on past intellectual property and production services in the UK paid by foreign firms or persons. It is unclear how these two are measured. For the film industry, the ONS uses a firm survey to estimate imports and exports for royalties and services. For videogames, no such survey appears to have been carried out. Likewise, if UK distribution subsidiaries of foreign firms account UK royalty streams to their foreign parents, but at the same time extend finance to UK developers for development of new titles, often no currency exchanges that are visible on the balance of payments has taken place, although formally, an export and import has happened (the ONS surveys for film do measure this and any proper import/export survey should).

Share of GDP and welfare impact

Relative software sales increased by more than an order of magnitude over the last 30 years, from 0.01 percent of GDP in 1980 to around 0.15 percent today (Figure 2.15).

Figure 2.15: Videogame software and hardware expenditure as percentage of GDP, 1980-2008



Sources: see Figure 2.12.

As with film and music, to assess the welfare impact, one needs to calculate the full cost, including the time spent using games. As it is difficult to do other things while playing games, the wage rate is a good indication of the value of time, assuming people do not play at work. Since games on portable devices are easily playable in transport and during waiting times, in which one could not have earned a wage, it seems sensible to value the time at 0.75 the wage rate, given that many studies value consumers' transport time at half their wage rate. Because many games are played

by persons below the legal working age, we further discount the value of time to half the wage rate.

In 2008, 87.8 million software titles were sold. If we assume that on average people played 3 hours a week per unit sold in the year (including time spent on old games), Britons played a grand total of 13.7 billion hours. The value of this would be $13.7 \times 12.77 \times 0.5 = \text{£}87.5$ billion. As with film, the software sales of £2 billion are dwarfed by the value of the time Britons devote to playing games.

Imports and exports

Systematic import/export time series data do not seem to be available. Only for 1997-2000 data is available, collected for a DTI report. These data suggests that Britain has a substantial comparative advantage in 'interactive leisure software' (the definition of the import/export category). The surplus fluctuated between 20 and 40 percent of total trade, and is about double the balance of British films (Table 2.11).

Table 2.11: Real imports and exports of the UK videogames industry, 1997-2000, in millions of pounds

	Exports	imports	balance	trade	bal/trade
1997	454	192	262	646	41
1998	503	284	219	787	28
1999	482	206	276	688	40
2000	488	302	186	790	24

Source: DTI (2002).

Backward linkages to videogames seem to be the film and music sectors, which deliver stories, visual material, songs and pre-existing brand-awareness to new videogames. Forward linkages include many professional applications for games, such as military simulation packages, educational simulation packages, flight simulators, and usage of game chips and game programming techniques for tasks such as medical imaging equipment and data visualisation.

Productivity

In 2008, about 8,850-10,000 people were employed in videogame development, and UK-based developers had total sales of £625 million (Skillset; Oxford Economics 2008), amounting to sales of £71,000 per person. As comparable data is not available for earlier years, it is not easy to measure changes in labour productivity. Oxford Economics (2008) found that the average wage was £30,000, meaning that £41,000 went to other inputs and profits.

LESSONS

There are a number of lessons in terms of Government policy from the short history of the videogames industry that may be of importance in developing sector strategies. In particular, direct, targeted subsidies appear to have played a very limited role in the industry's development. But there has been an important role for both sector level regulatory policies and horizontal Government support in skills and innovation.

1. While competition authorities have been active in this sector, their impact has arguably been limited by the speed of technological and market developments. For example, when, in 1995, the Monopoly & Mergers Commission published its report, the facts were already catching up with it. The Sony PlayStation had just been launched and only four years later would hold a larger market share than the Nintendo/Sega 'duopoly' in 1995 (Figure 2.13). Competition authority analysis in such fast-moving industries may be best served by focusing on dynamic rather than static efficiency.⁴³

2. The Government's open regulatory stance, resisting regulation censoring content of the industry may have contributed to growth.

3. The industry has benefitted from economy wide R&D tax credits. The industry has been characterised by significant international tax 'competition'. Given overseas subsidies, notably from Canada and France, Government is arguably faced with a difficult choice in either allowing the industry to compete on an equal footing with overseas investors, or giving the sector special treatment compared to domestic counterparts.

4. Skills policies have played an important role. Businesses have benefitted from graduates of part-funded Government courses in both specialist videogames fields and broader STEM and Arts degrees.

5. The sector continues to benefit from, and contribute to, both other creative industries, and other project-based industries such as finance, law and business services.

43 Since the Nintendo case the competition authorities have become somewhat more receptive to lines of reasoning that take into account dynamic efficiency. A UK supplied appendix in OECD Competition Commission (2008) acknowledges, following Aghion, Howitt and Vickers (2001) and Aghion, Bloom, Blundell, Griffith and Howitt (2005), that the relation between product market competition and innovation can have an inverted U-shape (the shape can vary by market type) and calls for competition policy to strike a balance between static and dynamic efficiency. Office of Fair Trading (2002) explores similar issues and even uses the Sega/Nintendo case as a case study, strongly making the case that the MMC could have better taken into account dynamic efficiency.

2.6 Comparing the industries

All three industries are driven by technology that causes sharp upturns and downturns in sales. The industries emerged because of new technology that made theatrical entertainment, music and playing games tradable, and have developed ever since as new technological waves have swept through those industries. In music and videogames, new hardware platforms often swept away old platforms, while in film new platforms generally provided additional outlets to the old platform.

In all three industries, distributors release a portfolio of differentiated time-sensitive fashion-like products, with many misses and a few hits. The time sensitivity is highest in film and music, where sales in the first few months generally dominate subsequent sales, and substantially lower in videogames, where hits can sell very well for several years (but where back catalogues quickly become outdated).

All three industries are also characterised by high fixed and sunk costs, which are probably highest in film and lowest in music. Sunk costs in videogames are mitigated by the absence of star creative inputs. Marketing expenditures are large in all three industries, as marginal costs are low, and marketing is feasible until the last marketing pound equals the last pound of sales. In film and music, marketing costs are probably higher than in videogames.

Distribution is the key in all three industries. Major international distributors dominate distribution access and are able to finance the development of the creative products, and by their incumbency guarantee future revenue streams to production firms and creative inputs. Except for EMI in music, these firms are now all foreign; the most important ones in videogames having been taken over by Japanese and US firms. In film, six entrepreneurs attempted to build an international distributor, all of which failed, except for the last one, PolyGram, which appeared close to success but was then taken over by a US competitor.

Concentration in film and videogames jumped in the early phase of their history, while in music it was high from the start, sharply declined with new entry in the 1950s and 1960s, and then rose again.

Geographical concentration in London was high in film and music but not in videogames. Even in film postproduction, a technical activity not that dissimilar from videogames, geographical concentration was high with most firms being located close together in Soho, suggesting that there is something about the project-based nature of film-making, with many inputs provided by separate companies, that commands location in proximity.

Policy intervention only happened on a grand scale in film, the industry in which Britain probably was relatively weakest. In music and videogames policy intervention was almost absent.

Table 2.12: Stylised comparison of the British film, music and videogame industries, 2008

	Film	Recorded music	Videogames
Size of entire UK market, broadly defined	£3.7 billion	£1.3 billion	£3.5 billion
Percentage of GDP	0.3	0.10	0.25
Longest known long-run real growth rate of UK market (per cent per annum)	0.8 (1934-2008)	2.2 (1930-2008)	12.8 (1980-2008)
Film production, music A&R or videogame development expenditure in UK	£578 million	£226 million	£625 million
(Prod/A&R/devpt spending) / (UK sales)	15.6 %	17.4 %	17.9 %
Employment in film production, music A&R or videogame development (persons)	21,113	15,000 ^a	8,850
Revenue per person (2008)	£27,000	£15,000 ^a	£71,000
Age	114 years	120 years	34 years (c. 44 years including arcades)
Percentage share of UK-made content of UK market (2008)	28	46	45?
Four firm concentration ratio in distribution	56	79	52
Technology	New distribution technologies additional	Waves of new technology that replace old forms	Waves of new technology that replace old forms
Star creative inputs	Important	Important	Absent (but licensing film and music)
International distribution headquarters located in UK	Paramount Pictures Universal Pictures	EMI	
International production headquarters located in UK	Warner Brothers	EMI	
Geographical concentration	In London (high)	In London (high)	Throughout the country (low)
Policy	Much intervention	Little intervention	Little intervention
US	US distributors dominate UK film industry	Mixed picture	US and Japanese distributors dominate
Significant firms	Film4, BBC Films, Working Title Productions, Aardman Animation, Ingenious Media	EMI	Eidos UK

Notes: figures with question marks are guestimates and are currently being pursued with industry associations. Videogames sales include hardware console sales. Film concentration ratio is the average over 2005-2007. Videogames concentration ratio is the ratio for the world-wide market, not the UK market. Music market figures are retail sales and excludes royalty and licensing income. The 2008 music A&R figure is the 2007 figure (£219 million) multiplied by 1.03.

^a The employment and revenue per person data for the recorded music industry are not separately available; the above values are estimates.

BRITISH STRENGTHS

The key British strength is in internationally marketable creative inputs

In this area, Britain is on top of the world, with few other countries with more creative inputs per head of population or proportion of GDP. British firms are also very competitive in production and development. The financial, legal and other business services available in London are important for the creative industries because close proximity and informal contacts are often important in project based industries. Many firms specialised in film and other media financing are based in London.

In all three sectors the aforementioned rights-based multinationals (RBMs) are important. International distribution is a particular UK strength. Although in the latter only one firm, EMI is UK-owned, several other film and videogame firms have their international headquarters in London. British managers play a disproportionate role in the management of the RBMs.

In music, one RBM is British-owned; in film many attempts have been made to establish UK-owned RBMs, which all failed; and in videogames all major British multinationals have been taken over by Japanese and US firms.

The substantial foreign investment in British media industries is probably due to the stable political climate, the equal treatment of foreign firms, and the openness to foreign firms and products. In film making, for example, major competing EU locations are Berlin and Prague. US studios appear to somewhat less easily commit to making films in other EU countries such as France, Spain or Italy.

The relatively loose regulation in Britain, with the culture that everything that is not explicitly forbidden is allowed, may also give it an advantage relative to many other EU countries, making it easier for foreign firms to enter and for all firms in the creative industries to make project-based deals among many different participants.

Outlook

Future technological changes may affect the way in which Britain can exploit its strengths. Britain has, for example, been traditionally very strong in live entertainment, but this was not tradable until about 1900, and when it became tradable, most filmed entertainment came to be made in Hollywood. During the second half of the twentieth century, however, live entertainment has become far more tradable because of the invention of the jet aircraft. Jet travel allows creative inputs to be utilised at least an order of magnitude more than previously by flying to the spots in the world where the audience is largest, and by enabling consumers from around the world to fly into London and consume the live entertainment, with adjacent services such as hotels, restaurants and tourism capturing additional revenue. The rise of intra-European budget travel over the last ten years, has enormously expanded the exports of British live entertainment.⁴⁴ Jet travel has had comparable effects on the input side for many other project-based industries, though

44 Again, as with many creative industries, better statistics could be collected on this sector.

probably not on the demand side. The future may hold other technological changes that may increase (or decrease) Britain's ability to exploit its comparative advantage in project-based industries.

The future of the British entertainment market depends also on the long-run growth in real wages and consumer preferences for labour versus leisure. The balance can shift to either side. During the Industrial Revolution, a higher productivity of leisure time induced consumers to work longer hours, which also enabled them to buy the goods that improved their leisure time. During the Second Industrial Revolution, however, a higher productivity of both labour and leisure time induced consumers to take more leisure to consume all the new leisure services including cinema, records and radio (Becker 1965, Bakker 2009).⁴⁵ If innovations in entertainment keep up the productivity of leisure time, higher real wages need not lead to British consumers working more (Table 2.13).⁴⁶ Likewise, if both labour and leisure productivity growth stagnate, leisure hours might remain constant. In the asymmetrical cases, leisure hours may go up or down substantially, depending on whether income or substitution effects dominate, which will have important positive or negative implications for the British entertainment market.

Table 2.13: Potential effects of labour and leisure productivity growth on the number of leisure hours

Leisure productivity		
Labour productivity	Constant	Growing
Constant	No change	LH ↑ or LH ↓
Growing	LH ↑ or LH ↓	LH ↑ if $e_y > 1$

Notes: LH = leisure hours, e_y = the income elasticity of time-intensive activities

International trade policy

Since 2005 the WTO has adopted a cultural exception. Governments can support creative industries to protect the expression of indigenous culture. Countries compete to attract creative production, often through tax breaks. In the EU these need to be approved by the European Commission. The US, which was a staunch opponent of the cultural exception, now has many states that offer liberal tax breaks for film making. Changes in the US tax climate can have a major adverse impact on UK film production, as 60 percent of it is funded with US capital.

Within videogames, Canada has instituted very generous tax breaks on R&D expenditures and the first five years of salary of new R&D personnel. In Europe, France has used the cultural exception to support its videogame sector. The UK needs to be sensitive to what is happening elsewhere and respond appropriately.

45 As both labour and leisure productivity increased, the full income increased, and with time-intensive activities having an income elasticity substantially higher than unity, consumers increased their leisure hours (Becker 1965; Bakker 2009).

46 For simplicity, the productivity of household production has been ignored here.

LESSONS

Large-scale policy intervention

1. Policy intervention in itself in the creative industries is probably not very useful. The market might be better than policy makers in picking winners, whether it be winning firms or winning industries. A cultural argument, however, can be (and has been) made for intervention. These industries make cultural products, and a society may value that at least some share of these products is provided within its own cultural context. Many consumers probably would not wish for their children to only be able to see American films, hear American music or play American videogames. If a cultural argument is made, then tax breaks and other 'blind' policies are an effective way to support UK content. Other mechanisms that have traditionally been used in Britain are award-by-committee, and one-person decision makers in non-profit organisations that have the freedom to make their own subjective judgements, such as currently happens in Film4 and BBC Films, with considerable success.

2. A factor that may help to attract investment, is the EU content quotas in some countries. In films, for example, US productions in Britain undergo an EU-approved cultural test to qualify for tax breaks. If the film passes the test, it is culturally British and presumably can be used in any EU country to fulfil EU content quota. The French firm CanalPlus, for example, invests in British films of Working Title Productions in order to fulfil its French EU-content quota obligations. A similar situation helped Britain attract several Japanese car factories in the 1980s. Situations like this might, for example, entice Hollywood to found London animation studios turning out US-financed animation films that pass the British Cultural Test and thus presumably become EU content.

3. If the cultural route is not pursued, or to prevent escalation of the worldwide cultural exceptions, international trade negotiations are important. British diplomats have already questioned the Canadian approach to R&D and videogame tax breaks, and it is not inconceivable that within existing treaties and WTO conventions, or by drawing up new ones, something could be done about tax competition from abroad. However, if the cultural argument is not considered important, tax competition from abroad may lead to cheaper products and services for UK consumers, depending on the terms of trade.

Small-scale policy intervention

4. Smaller-scale, specific policy interventions could involve making existing schemes more available to the creative industries. Film production companies have asked to make the Export Credit Guarantee Scheme available for foreign pre-sales of film productions. This could have a major effect on the financing of independent British films, with UK financiers being more willing to extend credit. In this way it could grow the part of the industry (non-US backed productions) where there are the most growth opportunities, and where potential is most constrained by financing challenges. Foreign pre-sales are exports just as tangible goods are and it is difficult to see why they do not qualify for the ECGS. As early as 1978 a House of Commons report asked for this anomaly to be remedied, but little has been done in the intervening thirty years. The scheme could also be extended to videogame developers.

5. Likewise the regulation on Venture Capital Trusts could be made more inclusive for investments in films and videogames. Possibly some other regulations could be made less biased towards old industries.

Supply-side policy

6. Given that creative industries are project-based industries with substantial agglomeration economies, and that especially in film and music, they are concentrated in London, infrastructure policy may focus on improving transport within the London industrial district and increasing its scope. Extending high-speed rail links throughout the country, for example, making half of Britain within an hour's ride from London, could have significant spillover effects for the creative industries by making it faster and easier for specialised services and creatives to reach the London market, facilitating coordination, informal contacts and flexible specialisation, especially in industries such as film-production that are time-sensitive.

7. Education and skills are incredibly important, and regulation could focus on designing new initiating, governance and funding structures for educational institutions. In film and music, Britain already seems to do reasonably well, although post-production experiences significant skill shortages. In videogames the top schools are in Germany and France, not Britain. One might think about regulation that would allow people to found new training courses or institutes and ways to ensure their governance would be aligned with industry interests (rather than a top-down foundation of new institutes/courses). A recent House of Lords report (2010) noted that it needs to be made clearer to secondary school pupils that 'studying science subjects like mathematics and physics, can lead to a career in the animation, computer games and post-production sectors.'

Better measurement

8. An effort could be made to measure the output of British creative industries more effectively. This would include the standard figures on employment, gross output, capital, productivity, as well as better import/export data and possibly a consistent methodology to measure the welfare impact of these industries in Britain.⁴⁷

Openness to new opportunities and technologies

9. Jet travel gave a boost to British live entertainment in the 20th century, and probably many new technologies and developments will follow that can affect the competitive position of British creative industries. To make sure Britain takes up these opportunities, light-touch regulation and an excellent education and training system are important.

⁴⁷ The aforementioned bulletin of DCMS, Creative Industries Economic Estimates Statistical Bulletin, does include estimates, but in some cases (necessarily, given data availability) these are made at high levels of aggregation that may not always be that useful for policy. Videogames, for example, are included with all other computer software, a sector that is about eight times as large, and music is also included in a larger sector with non-recorded music, which is about three times as large as the recorded music industry.

2.7 Britain's Strength in Project-Based Industries

The film, music and videogame industry each contain several different subsectors that 'fit' together and jointly lead to lower costs and higher quality output. In the film industry, for example, the world's top creative inputs, finance, production, studios, post-production and international distribution are all different activities, whose close proximity reduces overall costs. These intra-industry externalities were particularly important in film and music. For a new competing location in another country, copying one or a few activities will not work, one could only copy the whole ring of sectors together.

The creative industries together follow a similar ring of activities that lead to lower overall costs and higher quality output. Industries such as publishing, broadcasting, live entertainment, film, music, videogames, newspapers and news agencies all benefit from being close together, and Britain's leading international position in many of these industries, relative to its size, is partially due to these industries being together.

THE FIT WITH OTHER PROJECT-BASED INDUSTRIES

Project-based industries as a whole form a third ring of industries that together lower costs for other project-based industries in Britain. Specialised finance, lawyers and business services, for example, are key ingredients for biotech, film, music and videogames. The presence of all these services close together in the London industrial district leads to inter-industry externalities. While during the Industrial Revolution the North was one huge industrial district that drove the UK economy, today it is the South East.

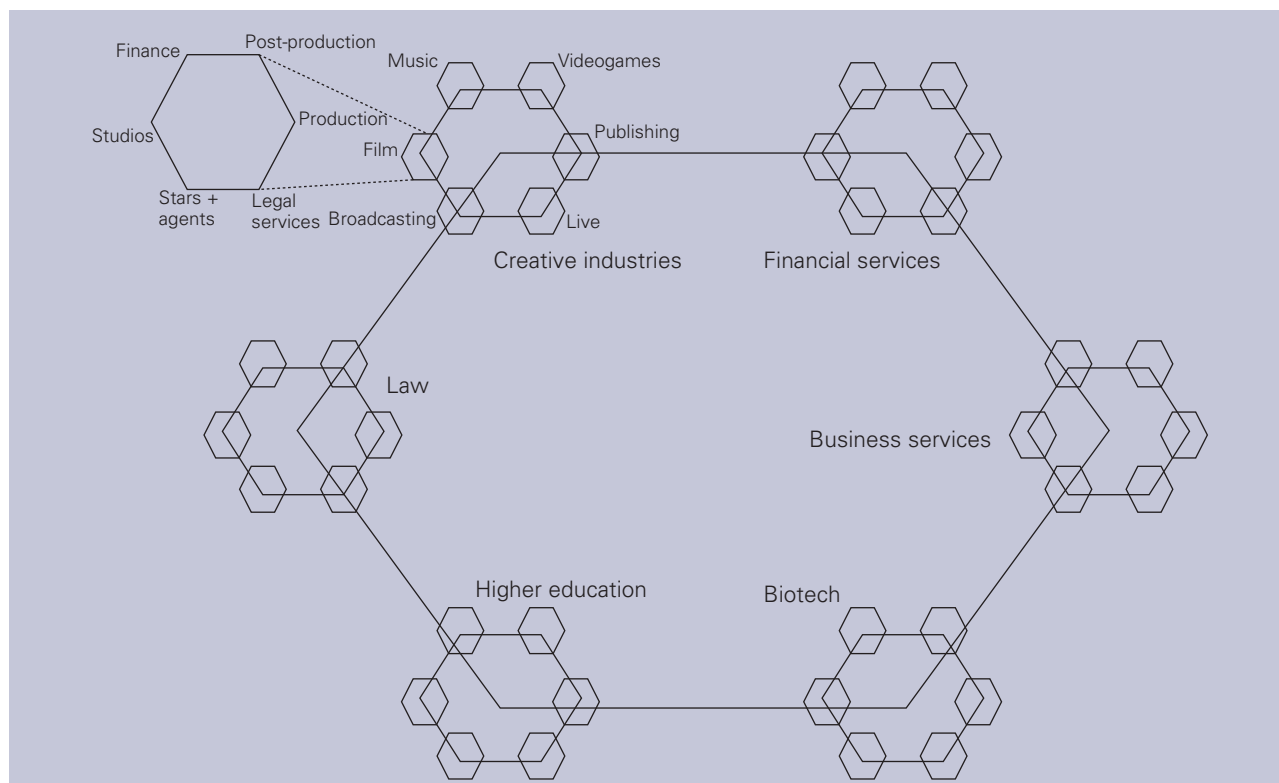
The creative industries have lots of links to these other project-based industries in which Britain excels, and which also show agglomeration effects. The industries reinforce each other. Britain is probably far stronger in project based industries, such as investment banking, the creative industries, higher education, pharmaceuticals, aerospace, corporate security, lawyers and business services, than in mass-production industries.

One of many potential diagrammatic representations of these interlinked Marshallian webs (Figure 2.16) shows how each industry, such as the creative industries, financial services, biotech, consists of a self-reinforcing ring of (product) sub-sectors – such as film, music, videogames – which each in turn consists of a self-reinforcing ring of (functional) subsub sectors, while the project-based industries together also form a self-reinforcing superring. They mesh into one self-reinforcing Marshallian superweb of knowledge spill-overs, external economies of scale and thick markets for specialised services. The bindings of each of the interlinked webs vary in strength, but few activities are vertically integrated. Instead they use the London/Golden Triangle industrial district to coordinate their activities.

Therefore, the webs appear to operate at three different levels. The Marshallian web encompasses the intra-industry agglomeration benefits (the smallest hexagons in Figure 2.16). What one could call a Marshallian superweb encompasses agglomeration benefits between various related industries (the medium-sized

hexagons in Figure 2.16), while Jacobs (1969) externalities encompass inter-industry agglomeration benefits between unrelated industries (the largest hexagons in Figure 2.16). The latter agglomeration benefits may still fall in between Marshall and Jacobs externalities, as the industries are not entirely unrelated but are all project-based.

Figure 2.16: Representation of the interlinked Marshallian webs of the British project-based industries



Notes: This is just one of many potential representations. Lines should run between all nodes of each hexagon, but have been left out for clarity.⁴⁸

Four main factors appear to strengthen the ties that bind each of the rings within the three levels. First of all, the London industrial district, providing one space for all these industries, is important. It is ranked first in the world in both business and media services with respect to linkages to other countries (Krätke and Taylor 2004). Second, the informal networks in which British society excels are important. The London Stock Exchange, for example, started in a pub, and the City of London claims one of its most important assets is the opportunity for informal networking. Third, the elite British education system, in which a few idiosyncratic top universities and schools turn out relatively few but high-quality creative, scientific and business star talent, appears to be important for most project-based industries. In these industries, abundant labour with an average standard education does not matter. Far more important are superstars. Many of the project-based industries are able to scale this talent disproportionately, and substitution of one superstar by many average performers might not be desirable. Fourth, the relatively loose British regulation compared to the continent, reinforced by the common law, gives these industries room to organise themselves as they see fit.

⁴⁸ This diagram is a conceptual framework, a way of looking at the territory and may not form a testable economic theory, although it might give some hints for further applied economic studies. The concept of 'fit' used in this diagram has now been widely applied to the internal organisation of firms by Holmstrom and Roberts (2004) and others, and it remains to be seen what value the concept has for analysing non-integrated coordinated activities. A simpler and older framework is the concept of forward and backward linkages introduced by Albert O. Hirschman, but these do not seem to capture the intra and inter industry externalities of industrial districts.

In many of these industries the traditional British variant of unions – fragmented, restrictive, technologically conservative and rather intrusive in management practices – appears to be conspicuously absent.⁴⁹

Potential new entrants in these industries have a high likelihood to locate themselves in the London district, and international companies are also likely to set up an office in the district. By its breadth and depth the district co-opts competition from potential new districts in other locations, as firms will choose the existing district; given that they offer deep markets for skilled labour, specialised support services, and the knowledge spillovers that pervade the entire district.

In some of these industries, such as several creative ones (film, music, videogames), biotech and pharmaceuticals, rights-based multinationals are important to exploit the products that the industrial district generates and give the district feedback on international tastes, by linking it to international distribution networks.

Scale economies in industrial districts

Many economic textbooks emphasize the scale economies in industrial districts (see, for example, Krugman and Obstfeld 2003). The argument is as above that many firms together reduce overall costs through the thickness of factor markets, external economies and knowledge spillovers. The first Thai watch firm, for example, may have far higher costs than the average costs in the Swiss watch industry. However, if 1,000 Thai watch firms started at the same time, average costs might be far lower than in Switzerland and a competing watch district in Thailand might emerge. Yet because those first firms have far higher costs than the existing district, such a district does not emerge. As argued above, these effects may hold both within and across British project based industries.

If this argument holds then the mechanics of the emergence of new industries is key because after that any new entrants compete with existing districts. The focus could be on policies that allow the emergence of new industries in Britain and reinforce the externalities. A key advantage of Britain may be that externalities *between* project-based industries may substitute for externalities *within* project-based industries during an industry's emergence. It might be the case that Britain is particularly conducive to the emergence of new industries. The four factors mentioned above may play an important part in this.

The above increasing returns could be characterised as 'cross-sectional' in the number of firms. In two recent papers, John Sutton (2001, 2005), crossing the bridge between the 'geography and trade' and the market structure literatures, argues that advantages also emerge longitudinally, in the time firms spend improving their capabilities. Developed industries in (developed) countries may have low costs per unit of quality because of years of incrementally improving quality. Newly emerging industries might not be able to compete because they are not able to start with the

49 Although it had been dominant in the creative industries, at least in the 1980s, restrictive union practices trying to micromanage studio floor organisation and union entry barriers diminished competitiveness. Most of these restrictions were abandoned during the mid-1980s.

right cost/quality ratio and to begin with can only make a product that cannot sell at any (positive) price (see also Bakker 2004: 50-53). Since they cannot sell this product they cannot develop their industry to the point where it will be able to compete. Thus high-wage industries in some (developed) countries are able to survive in the face of very much lower wages in other (developing) countries.⁵⁰

The emergence and growth of industries can thus be path-dependent in two ways: the growing number of firms leads to more and more external economies of scale, thick markets for inputs and knowledge spillovers; while the passing of time itself allows firms to introduce many incremental quality improvements, ever increasing the 'quality jump' that a new entrant would need to make. In both processes the role of history is essential.

Evidence for intra-industry and inter-industry externalities

The intra- and inter-industry externalities have been noted in studies on the effect of transport improvements, such as in Franker and Romer (1999), Combes et al. 2008 and, for the British case, Crafts (2009). Venables (2007) examined the narrower case of urban transport networks, suggesting that here previously unmeasured benefits might be especially high.⁵¹

Recent empirical studies on Britain carried out for the Department of Transport (Graham 2003, 2006) aim to separate and quantify the two types of agglomeration benefits. These studies point to strong benefits of both types, and conclude that improvements in transport may therefore yield large externalities that are not captured in the usual cost/benefit studies for new transport provision (see also Crafts (2009)). The studies suggest that generally the urbanisation (inter-industry) externalities are more prevalent and typically larger than localisation (intra-industry) externalities.

Urbanisation (inter-industry or Jacobs (1969)) externalities appear absent in the primary sector, strongly positive in services and mixed in manufacturing. The average urbanisation elasticity for services is 0.13, meaning that a one percent increase in urbanisation will yield an increase in productivity of 0.13 percent. The average value for manufacturing is about half as large. Policy to diminish congestion can partially mitigate diminishing returns to urbanisation in some industries.⁵²

The media services industry (SIC 921 and 922) has the seventh largest productivity elasticity among industries of 0.22, meaning that if London would grow ten percent, productivity in media services would grow 2.2 percent. One way this could be achieved is by improving transport networks, making the effective size of London larger. The media elasticity is about twice as large as the economy as a whole (Table 2.14).⁵³

50 This shows some similarities to the theory behind the 'infant industry argument' discussed by Nicholas Crafts in the introduction to this volume, although Sutton does not advocate direct Government intervention in these industries.

51 For a detailed economic policy study of the case of London see Travers (2009).

52 Graham 2006: 5-6.

53 Graham 2006: 6-7.

Table 2.14: Top-10 industries with the highest productivity elasticity of urbanisation

Rank	Industry	SIC codes	Elasticity
1	Mfg. radio, TV & communications	32	0.38
2	Transport services	60 – 63	0.33
3	Buss. & mgt consultancy	7414	0.30
4	Public admin, education & health	75 – 90	0.29
5	Finance & insurance	65 – 67	0.25
6	Hotels & restaurants	55	0.22
7	Media services	921 – 922	0.22
8	Construction	45	0.19
9	Advertising	744	0.14
10	Publishing & printing	22	0.11

Note: all elasticities are significant at the 1 percent level.

Only industries with statistically significant elasticities have been included.

Source: Graham 2006: 7.

The study of the magnitude of the urbanisation elasticity with respect to the degree of urbanisation shows that media services is the industry with the most persistent positive elasticity, after transport and public administration (whose top-positions are self-evident).⁵⁴ Its position is a tie with financial and insurance services. Media's productivity elasticity is about 0.50 for the highest density and 0.15 for the lowest density observed.⁵⁵

Localisation (intra-industry or Marshallian) externalities for media services also appear to be high, at 0.343. The estimation of the joint effect of localisation and urbanisation is problematic, probably because media activities are extremely urbanised, making estimation more difficult.⁵⁶ In terms of employment, for example, media services are heavily concentrated in London. In recorded music, 64 percent of all British jobs are in London, and for the various branches of film and video production and distribution, the share is between 58 and 64 percent (Table 2.15). The only other activities besides music and film and television in the top-10 are news agencies (such as Reuters), ethyl alcohol production and various financial services.⁵⁷

A different estimate of productivity elasticity with respect to both localisation and urbanisation externalities yields a value of 0.256.⁵⁸

An analysis of the international connections within business services and media services of large cities around the world finds that London was the most-connected city (having the most international links) both in business services and in media services (Krätke and Taylor 2004). It is followed by New York, Hong Kong and Paris. Only the number two, New York was also equally ranked (as number 2) in both activities. This corroborates the importance of the London industrial district both in

⁵⁴ Management consultancy is ignored here as it is an outlier with a very different pattern because of the 'megalopolis effect'.

⁵⁵ Graham 2006: 76.

⁵⁶ Graham 2006: 86-87.

⁵⁷ Graham 2003: 9.

⁵⁸ Graham 2005: 52.

intra-industry terms, as a media/entertainment district and in inter-industry terms as the major hub of project-based industries in the world, the location where the highest value added activities are carried out. It does suggest that in some respects the London district may be unique in the world.

The various studies by Daniel Graham discussed above suggest that both urbanisation and localisation externalities were strongly positive in media services, with a joint elasticity that was probably at least somewhere between 0.15 and 0.25. This provides strong support for the presence of Marshallian externalities, a Marshallian superweb (i.e. a web of related industries, something in between Marshallian and Jacobs externalities), and Jacobs externalities.

This suggests that further improvements in transport systems through road pricing (short run),⁵⁹ high speed rail links, urban transport networks, new roads and new airports (medium to long-run) can have a substantial effect on UK GDP and UK productivity at large, but will particularly further strengthen the various media businesses in which Britain is already strong. It could be part of an industrial policy based on increasing Britain's strengths, not on trying to micro-manage its weaknesses.

Table 2.15: Top-11 industries with the highest London employment concentration

Rank	SIC code	Industry	Loc. Quot.	% UK jobs
1	6511	Central banking	5.4	88
2	6711	Administration of financial markets	4.9	79
3	9240	News agency activities	4.8	78
4	1592	Production of ethyl alcohol	4.6	74
5	6712	Security broking and fund management	4.1	66
6	6523	Other financial intermediation	4.1	66
7	2214	Publishing of sound recordings	4.0	64
8	2232	Reproduction of video recording	4.0	64
9	9211	Motion picture and video production	3.7	59
10	9212	Motion picture and video distribution	3.6	58
11	9220	Radio and television activities	3.2	52

Note: location quotient means the degree of representation of an industry in London.

A value of 1.0 means that the industry has the same proportion of employment in London as elsewhere.

A value of 4.0 means that the industry has a four times higher proportion of jobs in London.

Source: Graham/Department for Transport 2003: 9.

One could wonder whether improvements in ICT decrease the benefits that an industrial district offers relative to dispersed location. A detailed economic geographic analysis of one of the three Marshallian agglomeration benefits – knowledge spillovers – in the London recorded music industry (Watson 2008) found that the international connections through ICT or within multinational organisations do not offer the same scope for knowledge spillovers as those within London. Particularly the study found that frequent face-to-face contact facilitates trust and informal knowledge exchange.

59 See Crafts 2009.

The localisation and urbanisation externalities also seem to differ somewhat between the various media businesses. While film and music, for example, are highly concentrated in London, videogames firms are more evenly spread over Britain. An obvious reason could be that videogame firms tend to be more integrated while film and music production is more flexibly specialised, with many free-lance individuals and specialised supply firms coordinating their activities. The question then remains, of course, why videogame firms are more vertically integrated. Potential explanations could be game developers developing firm-specific skills, or acquiring firm-specific sensitive information, and possibly the scarcity of inputs, especially the game developers, resulting in a thin market that may entice employers to pay premiums to keep developers and specialised supply services in-house.

Another reason could be the opposite, namely that subcontracting is easy in videogames, as outcomes are easier to specify than in films, and coordination can be done over a distance, at different times. So while for film, a director and all actors and technical personnel need to be at the same place at the same time (and the same holds for a music recording), for videogames there appears less of a need for physical proximity. Videogames also make less use of unique, difficult to substitute superstars.

A historical reason could be that transport and communication costs were far lower when the videogame industry emerged compared to the emergence of the film and music industries around 1900. This would imply that part of the concentration of film and music around London is path dependent.

The various potential reasons above make clear that further research would be necessary to pinpoint the reasons.

POTENTIAL PITFALLS

1. British project-based industries may be hostage to tax policies elsewhere, especially in the US. In the 1970s, for example, a series of US tax breaks led to an implosion of US investment in the British film industry.

2. Project-based industries may be especially sensitive to the exchange rate. Royalty rates often can not be adapted to changing exchange rates, and fluctuations in the exchange rates can lead to sharp shifts in service exports. The recently weak pound, for example, led to a prompt and large influx of US investment in British film production. This might also mean foreign investment in those industries might decline quickly if the exchange rate gets very high, especially because cost-savings in many project-based industries are hard to achieve without affecting quality, and involve large upfront sunk cash outlays.

3. Infrastructure technological changes, such as the growth of the internet and the decline of transport costs can work in two ways. They can reinforce the London district by extending its scope and reach, making it easier for customers to fly or link in, and for the workers to fly out or link out. They can also mean, however, that geographical proximity would become less important for informal networks, and thus erode the comparative advantage of the London district.

DYNAMIC EFFICIENCY

Industrial policy, regulation and competition policy could focus more on dynamic efficiency. The efficiency of markets is determined by three kinds of efficiencies: static efficiency, which can be divided into allocative and productive efficiency, and dynamic efficiency. A market is allocatively efficient if firms, given the technology that they happen to have, charge prices at marginal costs. It is (also) productively efficient if firms use the most efficient technology presently available in the market. And it is dynamically efficient if firms develop new products and services that make them more efficient in the long-run, but that do not presently exist.⁶⁰

A trade-off exists between static and dynamic efficiency. Prices that equal marginal costs give little incentive to sink costs in innovations, as one will be unable to recover those costs. In the creative industries, prices are usually far above marginal costs, so they tend to be allocatively inefficient. This is compensated for by the fact that they continuously turn out new products that consumers value highly, thus being dynamically efficient in the way of a fashion-good industry, every season turning out a portfolio of new products. Whether the British creative industries, and project-based industries at large, are productively efficient is difficult to say, as project-based industries often do not use extremely standardised practices. But given the fact that film, music and videogames are all exporters, and that foreign firms sink lots of money into UK production of content, it does appear that the creative industries are productively efficient. The same holds for many other project-based industries.

At the policy level, dynamic efficiency implies: 1) project-based industries turning out new products (or processes, forms of organisation and finding new markets and sources of supply)⁶¹; 2) new project based industries emerging in Britain; 3) persons choosing and shifting to the education and jobs for which they have the most aptitude and will be the most productive, meaning that human capital is efficiently created and can be transformed freely to new applications⁶²; and 4) capital easily moving towards new sectors and out of old declining sectors.

The importance of dynamic efficiency is shown, for example, by media policy in many EU countries and the EU itself, which for a long time focused on competition in feature films between Europe and the US. While European countries were subsidising feature films, the videogames industries emerged in the US and Japan, and in Europe big media firms emerged in sectors regarded 'uncultural' and not worthy of state support. The Dutch television company Endemol, for example, was spurned by the cultural and political establishment, but quickly grew into one of the most profitable and successful European media companies, sold to the Spanish firm Telefonica for 3 billion euros in 2000, and later bought back by its entrepreneurial management. The firm grew on the back of game shows and innovative reality TV programmes such as Big Brother, and also occasionally invested in Dutch feature films and high-concept, commercial musicals.

60 For a concise and accessible overview see Motta (2004: 39-100).

61 Schumpeter (1942).

62 One of the key distinctive features of the capitalist system, according to Hayek (1944).

Other examples are the reports of the Monopolies & Mergers Commission that noted a lack of competition in cinemas and videogames consoles, which both coincided with new entries by foreign firms building multiplex cinemas and by Sony launching its PlayStation.

Achieving dynamic efficiency

The trillion pound question in competition policy is how to measure and optimise dynamic efficiency. Several ways forward are possible. First, it is important to ensure that regulation applies equally to all industries, including new ones. This is conducive for a good business environment and dynamic efficiency allowing new industries, products and services to emerge. One thinks, for example, of the Export Credit Guarantee Scheme that could be applied to foreign film pre-sales and other service activities as well, or the Venture Capital Trust Scheme, which could be more flexible.

Second, it is also important to ensure that old regulation does not hamper new industries, and worse, is not mobilised by old industries to choke new ones. Existing regulation, for example, has become more costly in the face of a new technological era based on ICT. The US performs better in this respect than Europe (see, for example, Crafts 2006).

Likewise British competition policy could focus more on dynamic efficiency, looking less at concentration, margins and the number of firms per se, and more at anti-competitive practices, asymmetry between firms and collusion.⁶³ US competition policy, for example, appears slightly more conducive to dynamic efficiency. Using new economic theory, it is slightly more relaxed towards large mergers and single-firm competitive practises, but far more aggressive towards collusion between firms. In recent years publications such as OECD (2008) and OFT (2002) suggest the British competition authorities are starting to take the dynamic efficiency argument into consideration.

LESSONS

1. Several of the successful new industries, such as videogames and biotech, have not experienced much direct Government intervention, although indirect measures might have been important. This might point to focusing on a policy that creates the conditions in which new industries can emerge.

2. Industrial policy could focus on keeping good, and further improving, the British business environment for project-based industries. This could be done, for example, through maintaining and improving infrastructure within, and going out from, the London/Southeast industrial district, changing planning laws so that new business and millions of new homes can be built in London, Oxford, Cambridge and the rest of the Southeast, just as they once were built in Lancashire. A skills regulatory framework could be developed that creates initiation, governance and management mechanisms for stakeholders to (decentrally) address education, skills and training, without the need for a topdown approach.

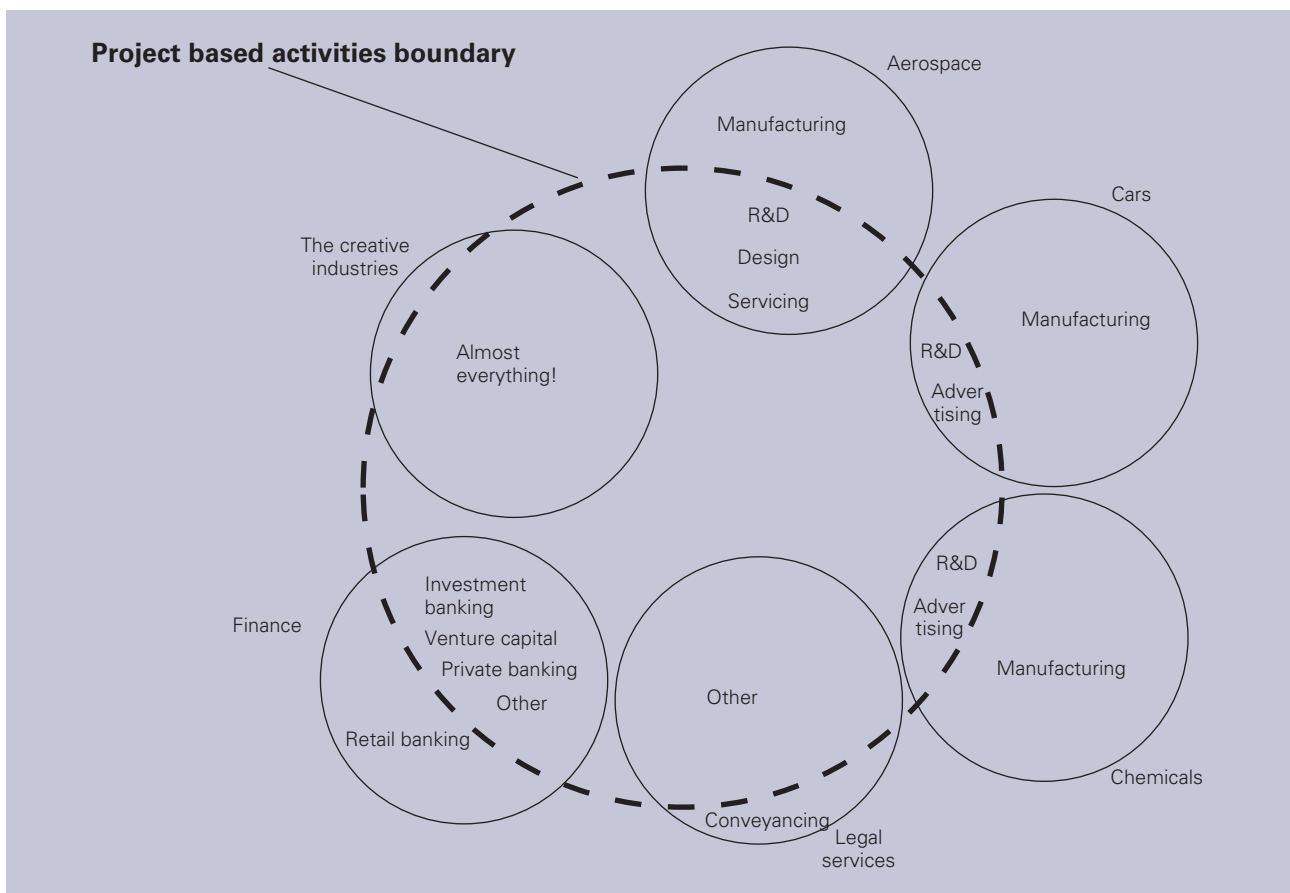
63 Motta (2004: 89), for example, concludes that, while competition policy should be concerned with market power, 'the elimination of market power – even if it were practicable – is not one of the objectives competition policy agencies should pursue'.

3. Because project-based industries involve high sunk costs and because often intra- and inter-industry externalities are perceived, Governments sometimes give tax breaks to these industries. These are often cultural and R&D-focused tax breaks. International trade policy, through Britain's membership of the EU and WTO, could attempt to limit these tax breaks to create a level playing field.

4. Policy could also focus on creating a business environment that allows for the reinforcement of project-based parts of other industries. Most industries have project-based parts in it, and a British approach focused on loose regulation, the Southeast district, informal networks, elite education, and creating a conducive business environment without singling out specific industries, could attract more of those parts to Britain (Figure 2.17). In many industries this is already happening. Although Britain has lost most of its textile fabric manufacturing, for example, it has top global fashion designers that capture a substantial part of the industry's value. Desirability of this policy depends on whether Britain can capture value in the project-based part, and on how it can work with large global multinationals dominating those industries.

5. It appears that Canada, and specifically its provinces Quebec and to a lesser extent Ontario, have been following this strategy for some time, offering massive R&D investment tax breaks and R&D salary cost subsidies, with the idea that this fosters the formation of an industrial district that once established will stay there for the rest of the industry's history. The strategy is dependent, of course, on the willingness of tax payers to bankroll this. Given that Quebec experienced the reverse of this strategy when it dabbled with independence in the 1980s and 1990s – a mass exodus of firms and human capital – tax payers may be more willing to fund this type of industrial policy now.

Figure 2.17: Hypothetical representation of the boundaries of the project-based segments of various industries



2.8 Select Bibliography

Aghion, Philippe, Christopher Harris, Peter Howitt and John Vickers , "Competition, Imitation and growth with step-by-step innovation," *Review of Economic and Statistics*, Vol. 68 (2001), 467-492.

Aghion, Philippe, Nick Bloom , Richard Blundell, Rachel Griffith and Peter Howitt, "Competition and Innovation: an Inverted-U relationship," *Quarterly Journal of Economics*, Vol. 120 (May 2005), 701-728.

Bakker, Gerben, "Stars and stories. How films became branded products," *Enterprise and Society*, Vol. 2 No. 3 (September 2001), pp. 461-502.

Bakker, Gerben, "Building knowledge about the consumer. The emergence of market research in the motion picture industry," in: *Business History*, Vol. 45 No. 1 (January 2003), pp. 101-127.

Bakker, Gerben, "At the origins of increased productivity growth in services: productivity, social savings and the consumer surplus of the film industry, 1900-1938," *Working Papers in Economic History*, No. 81 (2004), Department of Economic History, London School of Economics.

Bakker, Gerben, "Selling French films on foreign markets. The international strategy of a medium-sized film company," in: *Enterprise and Society*, Vol. 5 No. 1 (March 2004), pp. 45-76.

Bakker, Gerben, "The Making Of A Music Multinational: Polygram's International Businesses, 1945- 1998," in: *Business History Review*, Vol. 80 No. 1 (Spring 2006), pp. 81-123.

Bakker, Gerben, "Strategic Intent, Survivor Bias and Long-Run Analysis: Non-U.S. Entrants in the Motion Picture Industry, 1895-2005," unpublished manuscript, London School of Economics, Fall 2007.

Bakker, Gerben, *Entertainment industrialised. The Emergence of the international film industry, 1890- 1940* (Cambridge, Cambridge University Press, 2008).

Bakker, Gerben, "Time and Productivity Growth in Services: How Motion Pictures Industrialized Entertainment," in: *Working Papers in Economic History*, No. 119 (2009), Department of Economic History, London School of Economics.

Becker, Gary S., "A theory of the allocation of time," in: *Economic Journal*, Vol. 75 (September 1965), pp. 493-517.

Broda, Christian and David E. Weinstein, "Globalization and the gains from variety," *Quarterly Journal of Economics*, May 2006, 541-585.

Combes, P.-P. T. Mayer and J.-F. Thisse, *Economic geography: the integration of regions and nations* (Princeton, Princeton University Press, 2008).

Crafts, Nicholas, "Revealed Comparative Advantage in Manufacturing, 1899-1950," *Journal of European Economic History*, Spring 1989, v. 18, iss. 1, pp. 127-37.

Crafts, Nicholas, "Regulation and productivity performance," *Oxford Review of Economic Policy* 22 No. 2 (2006), 186-202.

Crafts, Nicholas, "Transport infrastructure investment: implications for growth and productivity," *Oxford Review of Economic Policy* 25 No. 3 (2009).

DCMS/The Work Foundation, *Staying Ahead: The economic performance of the UK's creative industries* (June 2007).

DCMS, *Creative Industries Economic Estimates Statistical Bulletin*, January 2009.

DCMS/BERR, *Creative Britain: New talents for the new economy* (2008).

Dickinson, Margaret and Sarah Street, *Cinema and state. The film industry and the British Government, 1927-1984* (London, British Film Institute, 1985).

DTI (2002), report on the UK videogames industry.

Entertainment Retailers Association, *Statistical Yearbook* (London, 2005- 2008).

Frankel, J. and D. Romer, "Does trade cause growth?" *American Economic Review*, Vol. 89 (1999), pp. 379-399.

Frontier Economics, Report on the Creative Industries, 2005.

Goolsbee, Austan and Peter J. Klenow. "Valuing consumer products by the time spent using them: an application to the internet," *NBER Working Paper* 11, 995 (2006).

Graham, Daniel, "Industrial concentration and agglomeration in London" Working Paper (London, Department for Transport / Imperial College Centre for Transport Studies, 2003).

Graham, Daniel, "Wider economic effects of transport improvements: links between agglomeration and productivity – Stage 1 Report" (London, Department for Transport / Imperial College Centre for Transport Studies, 2005).

Graham, Daniel, "Wider economic effects of transport improvements: links between agglomeration and productivity – Stage 2 Report" (London, Department for Transport / Imperial College Centre for Transport Studies, 2006).

Hayek, F. A., *The road to serfdom* (London, George Routledge & Sons, 1944).

Hill, John, "Government policy and the British film industry 1979-90," *European Journal of Communication* 8 (1993), 203-224.

House of Commons, Interim Action Committee, The financing of the British film industry: second report of the Interim Action Committee on the film industry (London, HMSO, Cmnd. 7597, 1979).

House of Lords Select Committee on Communications (2010) *The British film and television industries---decline or opportunity?* (London, House of Lords / Stationery Office Ltd., 2010).

Izushi, Hiro and Yuko Aoyama, "Industry evolution and cross-sectoral skill transfers: a comparative analysis of the video game industry in Japan, the United States, and the United Kingdom," *Environment and Planning A* 38 (2006), 1843-1861.

Jacobs, Janet, *The economy of cities* (New York, Vintage Books, 1970; orig. ed. 1969).

Jones, Geoffrey, "The Gramophone Company: An Anglo-American Multinational, 1898-1931," *Business History Review* 59 (1985), 76-100.

Krätke, Stefan and Peter J. Taylor, "A world geography of global media cities," *European Planning Studies* 12 No. 4, 459-477.

Krugman, Paul R., "Increasing returns, monopolistic competition and international trade," *Journal of International Economics* 9 (1979), 469-479.

Krugman, Paul R. and Maurice Obstfeld, *International Economics. Theory and Policy* (Reading, Mass., Addison-Wesley, 2003).

Monopolies & Mergers Commission report (1995).

Motta, Massimo, *Competition policy: theory and practice* (Cambridge, Cambridge University Press, 2004).

Oberholzer-Gee, Felix and Koleman Strumpf, "The effect of file sharing on record sales: an empirical analysis," *Journal of Political Economy*, Vol. 115 No. 1 (2007), pp. 1-42.

OECD Competition Committee (2008), *Competition, patents and innovation: policy roundtable* (Paris, OECD, 2008).

Office of Fair Trading (2002) "Innovation and Competition Policy," *Economic Discussion Paper*, No. 3 (March 2002) (London, OFT, 2002).

Oxford Economics, The economic contribution of the UK games development sector (Oxford, October 2008).

Puttnam, David, with Neil Watson, *The undeclared war. The struggle of control for the world's film industry* (London, HarperCollins, 1997).

Reid Margaret, *The Economics of Household Production* (New York, 1934).

Roberts, John, *The modern firm : organizational design for performance and growth* (Oxford, Oxford University Press, 2004).

Schumpeter, Joseph A., *Capitalism, Socialism and Democracy* (5th ed. 1976, Routledge 2000; orig. ed. 1941).

Skillset, *Skillset Census of Employment in the Creative Industries* (London, 2008)

UK Film Council, *Statistical Year Book 2009*.

Sutton, John, "Rich Trades, Scarce Capabilities: Industrial Development Re-visited," in: STICERD Discussion Paper, London School of Economics, No. EI 28 (September 2001).

Sutton, John, "Competing in Capabilities: An Informal Overview," in: Working Paper, London School of Economics, April 2005. Skillset, *Skillset Census of Employment in the Creative Industries* (London, 2008).

Travers, Tony, "Transport infrastructure in London," *Oxford Review of Economic Policy* 25 No. 3 (2009).

Ulf-Moeller, Jens, *Hollywood's film wars with France. Film-trade diplomacy and the emergence of the French film quota policy* (Rochester, University of Rochester Press, 2001).

Venables, A. J., "Evaluating urban transport improvements: cost-benefit analysis in the presence of agglomeration and income taxation," *Journal of Transport Economics and Policy* 41 (2007), 173-188.

Watson, Allan, "Global music city: knowledge and geographical proximity in London's recorded music industry," *Area* 40 No. 1 (2008), 12-23.

3. The Emergence and Survival of a Financial Cluster in Britain

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The views expressed within this chapter are those of the author and should not be taken as Government policy.

'I believe our banking system, and indeed the whole intricate organism of the City, to be one of the best and most characteristic creations of that part of the genius and virtue of our nation which has found its outlet in "business"'.
J. M. Keynes, 'The Prospects of Money', *Economic Journal*, 24 (1914), p. 633.

'The financial services industry plays a vital role in the UK economy. More than one million people work for it, adding economic value per head that is more than double the UK average. The industry accounts for around 8 per cent of output, and is responsible for contributing almost 14 per cent of the tax collected.'

UK International Financial Services – The Future: A report from the UK based financial services leaders to the Government, [H.M. Treasury, May 2009] p19

3.1 Introduction

At the beginning of the 21st century Financial Services were widely perceived as one of Britain's most successful industries, vindicating the conclusion reached by John Maynard Keynes a century before. In particular, the component of the Financial Services sector located in the City of London was judged to be one of the most competitive in the world.⁶⁴ This competitive strength has remained despite the Credit Crunch of 2007/8 which had deeply affected the City.⁶⁵ According to the Global Financial Services Index published in March 2009, London was still the leading international financial centre, hosting the most important markets in both money and foreign exchange and acting as Europe's interface with the rest of the world.⁶⁶

Much of this success has been attributed to cluster effects.⁶⁷ Once a cluster became established, it both generated self-sustaining growth and possessed the capacity to withstand challenges from rivals. However, the potential of competition between financial service centres has long been recognised and there has been a widespread belief that financial centres engage in a competitive struggle from which one, or a small number, emerge victorious.⁶⁸

64 M.E.Porter and C.H.M.Ketels, *UK Competitiveness : Moving to the Next Stage* [DTI Economics Paper No.3 May 2003] pp 22, 40

65 IFSL Research, *International Financial Markets in the UK*, May 2009 p 1

66 Z/Yen Group, *The Global Financial Services Index* [Corporation of London 2009]

67 IFSL Research, *International Financial Markets in the UK* [May 2009] p 4

68 'The City Revolution', *F T* 27th October 1986; 'The New City', *FT* 26-29 March 2006; *FT* 15/September/2008, 13/March/2009, 17/April/2009

Consequently, in considering the factors which led to the success of the UK's financial services sector it is important to take a long-term perspective. This should reveal when and how this financial cluster emerged and what has underpinned its growth and survival over such a long period.⁶⁹ This paper examines the history of the UK financial services sector, in particular highlighting the role that Government actions and policies have played over time. Based on this, the paper suggests some policy lessons for Government for shaping future sectoral strategies. While these lessons are drawn from the experience of the financial services sector, they are broad policy lessons which apply to all sectors rather than the financial services sector specifically.

3.2 Overview and characteristics of the UK financial services sector

Before proceeding to the historical investigation it is essential to have a clear understanding of what financial services are in a British context. Financial Services cover a wide variety of economic activities ranging from intermediaries dealing directly with consumers, as in the provision of personal investment advice and branch banking facilities, to wholesale markets in which trading in commodities, derivatives, securities and foreign exchange takes place, as well as inter-bank borrowing and lending. A large component of the Financial Services sector is widely dispersed so as to be in face-to-face contact with potential consumers, making clustering impossible. Such a situation exists in retail banking. In contrast, in wholesale activities trading is highly concentrated as in the markets for currency and securities which are accessible only to financial specialists.⁷⁰ In 2008 Financial Services in Britain were almost equally split between retail and wholesale, with the latter heavily concentrated in the City of London.⁷¹ Of those employed in Financial Services in 2009 31 per cent worked in London and this spatial bias has long existed.⁷²

Overall, in 2008 Financial Services were responsible for 7.6 per cent of gross value added in the British economy.⁷³ Financial Services were an important source of high-paid employment, produced large corporate profits, and provided a significant share of tax revenues. It was estimated for 2001 that those employed in the City of London, though only 1.25 per cent of the UK labour force, generated 3.5 per cent of Gross Domestic Product.⁷⁴

Financial Services in the UK are also export orientated, especially that component located in, or attached to, the City of London. A comparative study of financial services in London and New York, undertaken in 2000, observed that, 'While both London and New York are global financial centres it would be fair to characterise London's business as being primarily international, whereas New York's business is predicated on its vast domestic market.'⁷⁵ In 2008, it was calculated that the percentage split between business for domestic, as opposed to overseas, customers

69 UK International Financial Services – The Future: A report from the UK based financial services leaders to the Government, [H.M. Treasury, May 2009] p 37

70 R.J. Johnston and V. Gardiner, *The Changing Geography of the UK* [London 1991] pp 244-8

71 London Economics, *The Importance of Wholesale Financial Services to the EU economy* [London 2009] pp 33,112

72 UK International Financial services – the future: a report from the UK based financial services leaders to the Government, H.M. Treasury, May 2009] p 19

73 Financial Times, 24th July 2009

74 Lombard Street Research, *Growth Prospects of City Industries* [London 2003] p20

75 Corporation of London, *London and New York Study: The economics of two great cities at the millennium – Final report: section 2 – Financial Services* [London 2000] p 28 cf p34

by the City of London was roughly equal (52 per cent domestic and 48 per cent overseas).⁷⁶ London conducts a significant amount of global banking activity. In 2008, London's share of cross-border bank lending was 18 per cent while its share of foreign exchange turnover was 35 per cent, being higher than either New York or Tokyo in both cases.⁷⁷

In 2005 domestic financial assets totalled \$51 trillion in the USA compared to \$8 trillion for the UK but London and New York were comparable financial centres in terms of employment, at around 325,000.⁷⁸

It is also important to recognise that Financial Services are important not only for what they are but because of what they do. Unlike other economic activities the actions of those working in Financial Services have serious and wide-ranging implications for the entire economy. A severe contraction of credit will impact on both consumers and businesses restricting their economic activity, leading to a recession or even a prolonged depression. The financial sector provides the link between savers and borrowers separated by both time and space. Without that link those with savings to invest would lack opportunities to do so while those needing to borrow capital would find it was not available. Whether through banks or markets the financial sector bridges time and space, and the more efficiently it does this the lower are the transaction costs, the higher the returns that savers receive and the lower the cost of credit and capital faced by borrowers. The more advanced the economy is the more sophisticated the financial instruments in use are and the more complex are the processes involved. Type, duration, location, currency, and price are only among the many characteristics that need to be considered when matching the needs of savers and borrowers or buyers and sellers, and it is this that Financial Services do.

3.3 The history of the UK financial services sector

OVERVIEW OF THE GROWTH OF THE FINANCIAL SERVICES SECTOR

Events which have been instrumental in establishing the UK's strength in financial services date back to the formation of the Bank of England in 1694. However, the sector really began to grow in importance from the 1850s onwards. Table 3.1 shows that before 1850 financial services was a very small component of the British economy as most borrowing and lending was capable of being conducted both informally and locally. Even a large scale project like canal building in the late eighteenth century drew heavily on local sources. According to the census of 1851 only 0.1 per cent of those in employment worked in Financial & Business Service industries. This figure grew steadily over time until the 1970s, when the sector entered a period of particularly strong growth spurred by growth in money markets, coinciding with the ending of fixed exchange rate regimes in the early 1970s. By 2009 over 20 per cent of total UK employment was in financial and business services.

76 Corporation of London, London's Place in the UK Economy 2008/9 [London 2008] p 37

77 IFSL Research, International Financial Markets in the UK [London 2009] p3

78 McKinsey, Sustaining New York's pp 9, 32

Table 3.1: Employment in Financial and Business Services, 1851 – 2009

Year	Total Number	Share of Total Employment in UK
1841	6,281	0.09%
1851	5,694	0.06%
1861	17,248	0.16%
1871	29,243	0.25%
1881	48,444	0.38%
1891	73,772	0.51%
1901	113,174	0.70%
1911	178,052	1.0%
1901	165,774	1.02%
1911	242,446	1.32%
1921	332,810	1.75%
1931	389,323	2.06%
1951	435,121	2.0%
1961	571,240	2.45%
1971	952,170	4.01%
1980	2,701,000	11.0%
1990	3,813,000	15.6%
2000	4,761,000	18.7%
2007	5,717,000	21.2%
2009	5,590,000	20.9%

Notes and data source: These statistics cover banking, insurance, finance and business services. Those for 1851–1971 are taken from C. H. Lee, British Regional Employment Statistics, 1841 – 1971 [Cambridge 1979]. The years 1841–1911 are drawn from the A series of tables and 1901 – 1971 from the B series. The A series is based on employment definitions that significantly undercount service occupations. The B series is less defective but undercounting remains a problem. Those for 1980 – 2009 are taken from the data produced by the Office of National Statistics for the first quarter of each year. These series breaks should be noted when considering change over time. It should also be noted that this data covers a sector of the economy wider than the narrow definition of financial services used here.

LAYING THE FOUNDATIONS AND ESTABLISHING FIRST MOVER ADVANTAGE: PRE 1850

Most of the major innovations in financial services can be traced to Northern Italy and the Mediterranean region in the medieval period from whence they spread to the rest of Europe. Britain was a relative latecomer in the process, benefiting from the arrival of those from the Continent, especially the Netherlands, who were skilled in financial services.⁷⁹

However, Britain (more specifically London) developed a first mover advantage with the establishment of the Bank of England in 1694. This was formed on the joint-stock principle which meant it was owned by numerous investors who supplied it with a capital far larger than the partners of a private bank were capable of. It accepted deposits from the public, provided credit to its customers, and could issue its own currency. However, it was not simply scale that made the Bank of England important.

79 G. Felloni and G. Laura, Genoa and the History of Finance: A series of firsts? [Genoa 2004]

Its entire capital was lent to the Government in return for a fixed payment. This meant that those investors owning Bank stock possessed a relatively safe investment and one that was very flexible as it could be readily bought and sold once a market developed in which this could be done. Such a market developed in 18th century London eventually achieving a permanent and formal existence with the formation of the London Stock Exchange in 1801.

By then the Bank of England's success as a special investment vehicle had not only been copied by others but also emulated by the Government itself with the creation of the Consolidated Debt (consols) in 1749. The result was a financial instrument that allowed the Government to raise funds at low rates of interest, and so finance a succession of wars, and was attractive to investors because of its marketability and flexibility. This underpinned the development of both the money and capital market in 18th century London and fostered the centralisation of financial activity there.

Accompanying this revolution in the role played by the financial sector in public finance in the 18th century was the transformation of banking. In London two types of bank emerged. In the West End, banks served the wealthy by providing them with a place to deposit their savings and a source of loans. In the City, banks served the needs of merchants who were, at different times either short of the funds they required to finance purchases or in possession of a surplus once sales had been made. What developed was a mechanism through which supply and demand was matched through the use of the bill of exchange. A bill of exchange was a note promising payment at a specified date in the future. By buying these at less than face value, the purchaser obtained a return representing the difference when they were redeemed.

Outside London, bankers also became increasingly numerous during the 18th century, as they responded to the growing pools of local savings and the requirements of local business for credit. Other than in Scotland, these banks operated as small partnerships, as because the charter given to the Bank of England prevented the formation of corporate rivals in England until after 1826. Non London based Scottish and English banks all established a London connection, or correspondents, through which they could either lend money, when in surplus, or borrow when in need. This made the London money market the fulcrum of the British financial system.

By 1850 London had emerged as the largest financial centre in the world because of the success enjoyed by the British economy during the Industrial Revolution and the relative political and social stability the country enjoyed. The centre existed to serve the needs of the British economy, including its relations with the rest of the world, rather than the global economy.

CREATING THE CLUSTER, 1850 – 1914

It was in the years between 1850 and 1914 that Financial Services first emerged as an important sector within the British economy, and the City of London became an internationally competitive cluster. Internally, this was a direct consequence of rising per capita income, as this generated a growing supply of savings, and an increasing

complexity of economic activity which required a means of payment. Externally it was driven by the growth of the global economy and the increase in international trade, as this generated a demand for capital, which British investors were in a position to supply, and for credit, to cover the longer delay between production and payment that distance between producer and consumer created.

A dense financial cluster developed in the City of London located around the Bank of England and the London Stock Exchange. This cluster was also in a position to service the world economy as the coming of the telegraph revolutionised international communications. In 1851 London and Paris were connected by submarine cable with a permanent link to New York laid in 1866. By the end of the 1870s London was in telegraphic contact with every important financial centre in the world and further improvement came with a telephone line to Paris in the 1890s. The City of London was increasingly providing the liquidity that the world economy required as transactions became global because it was the single location where funds could always be lent or borrowed or financial assets bought or sold.⁸⁰

The foundations laid before 1850 were important in this. Britain was the largest trading nation in the 19th century and so London banks had developed extensive links through which credits and debits for goods sold and purchased could be made. Through a link to a London bank, foreign banks could access this existing network. In turn, the more links London banks had to other banks around the world, the greater was the necessity for a bank to establish a London connection.

In addition the British banking system was attractive as it was transforming into a highly stable system. Banks formed on the joint-stock basis came to dominate, operating a nationwide branch banking system, with the exclusion of Scotland, from a London head office. By 1913 London-based banks controlled 79 per cent of deposits and operated 77 per cent of the branches of the British banking system. In the process they internalised many of the operations once performed by the London money market as they could distribute funds between branches as directed by the London head office. By then they had perfected a way of operation that allowed them to use short-term deposits to extend longer-term loans in a way that was both safe and profitable. The great strength of the branch banking system was that funds could be easily and quickly moved to where they were required, so providing defence against a local crisis that would destroy any single branch.

Also the Bank of England provided stability and certainty to the whole system by acting as a lender of last resort. Banks could borrow and lend to each other through the mechanism of the discount houses. By selling a bill to a discount house a bank received money while buying a bill from a discount house meant they loaned money. Any shortfall between the bills bought and loans obtained by the discount houses was made up by the Bank of England, which charged an above market rate for the money provided.

80 A.J.Field, 'The Telegraphic transmission of financial asset prices and orders to trade: Implications for economic growth, trading volume and securities market regulation', *Research in Economic History* 18 (1998) pp 147, 159, 175

In contrast the US banking system remained fragmented throughout this period, because of legislative impediments to inter-state branch banking, operating without a central bank until 1913. London's main rival as a financial centre, Paris, was also experiencing difficulties as it was besieged by the Germany army in 1870.

The result was that there were an increasing number of foreign banks which set up branches in London or, more commonly, set up correspondent links with London banks (see tables 3.2 and 3.3).

Table 3.2: Foreign Banks with London Offices, 1913

Region	Number of Banks	Percentage
Australia and New Zealand	12	17%
North America	12	17%
Latin America	3	4%
Africa/Middle East	11	15%
Asia	6	8%
Europe	27	38%
Total	71	100%

Data source: The Banking Almanac [London 1913]

Table 3.3: Number of Foreign Banks linked to London

	1890	1912	1938	1961
No. of banks	237	1,211	2,362	2,297
Europe	67	627	1,497	1,238
Latin America	15	415	131	255
North America	92	99	573	461
Asia (-Mid East)	21	36	83	148
Australia/NZ	32	19	12	20
Africa/Mid East	9	15	66	150
Unknown	1	–	–	25
No. of links	295	2,046	3,823	5,992

Data source: The data in this table was compiled by Dr Simon Mollan from the entries in the Bankers Almanac for the selected dates

Over the period 1850 – 1914 the London capital market cluster also developed significantly. Prior to this time, those in the City involved in the issue of long-term loans, had confined their operations to the National Debt and related securities. However, beginning in the 1820s, they branched out into both foreign Government debt and then corporate stocks and bonds.

From the end of the Napoleonic Wars in 1815 and the outbreak of the First World War in 1914, the British Government borrowed little, leaving investors looking for alternatives at a time when rising per-capita income was generating increased savings. These alternatives were found both domestically and internationally.

Domestically, the growing scale of business activity in certain sectors was outstripping the ability of small numbers of investors to provide the necessary finance. This situation was most acute in transport where the success of a railway depended upon the entire line, and even network, being completed if sufficient revenue was to be generated to make sale of stocks and bonds to numerous investors who were then remunerated by the dividends and interest paid, once the line was built and in operation. This is how Britain's railway network was financed, and it was largely orchestrated in London. Between 1853 and 1913 the value of UK railway securities traded on the London Stock Exchange rose by over £1 billion. The result was that British investors became familiar with this type of asset and so financed railways around the world. In addition, foreign and colonial Governments also issued loans in London, whether for the purpose of financing general expenditure, the costs of wars, or to fund infrastructure development like railways. An estimated £4.1 billion was invested abroad by British investors between 1865 and 1914, mainly in the form of securities that were then bought and sold on the London Stock Exchange.

The result was a large investment banking community in London that drew on talented individuals from both home and abroad. Britain became a source of trained bankers and investors for the world with around 10,000 operating outside the country by the First World War. Conversely, the City drew in from abroad those with specialist expertise and connections, ranging from German bankers and brokers, to the numerous European clerks employed because of their technical and linguistic skills.⁸¹

Though much of the activity of this London based investment banking community was internationally orientated, it largely served British investors, whether individual or institutional, as it was they that possessed the wealth that financed the creation or purchase of foreign assets. Smaller but important clusters existed in other financial centres, especially New York and Paris, which served their own investors in similar ways.

Connecting the money and capital market clusters were the stock exchanges located in these financial centres. Risk was reduced by confining operations to those securities actively traded on the stock exchanges as these could be quickly bought and sold at current prices when either the opportunity for investment arose or the necessity of repaying the loan arose. Such operations were of importance in Paris and New York but it was in London that they took place to the greatest extent. The New York Stock Exchange restricted its own competitiveness through a regime of mandatory fixed charges, a cap on membership, and strict controls on the securities traded.

The London Stock Exchange however, was not only the largest but also the most international in terms of the securities traded and its members had extensive links to members of other stock exchanges both within Britain and also around the world. This meant that the markets for securities traded on the London Stock Exchange were the most liquid in the world, and so very attractive to those who financed their purchases with funds borrowed from banks and which were repayable at short-notice.

81 G. Crossick (ed), *The Lower Middle Class in Britain, 1870 – 1914* [London 1977] pp 127-8, 132

During this period the UK financial services industry built on its existing strengths and by responding to changing domestic and global demands entered a phase of innovation and expansion. Two financial clusters emerged in London. One served the global market by providing an international payments network and access to a money market in which banks could both borrow or lend. The other channelled the savings of the British population to Governments, railways and other businesses both at home and abroad, and was very much a product of Britain's own wealth and international connections, including the Empire. The two were connected and both were located in the City but it is important to recognise the separate nature of each. These clusters were able to generate their own support services, whether in the shape of skilled labour or specialised buildings and were given the freedom to do so by benign regulatory and planning conditions.⁸²

CHALLENGES TO THE CLUSTER, 1914 – 1945

Between the outbreak of the First World War in 1914 and the end of the Second in 1945, these clusters faced a series of major challenges at home and abroad. Two World Wars made a major and prolonged impact, as did the deep recession in the 1920s and prolonged depression in the 1930s. There was worldwide monetary and financial instability throughout both the 1920s and 1930s, punctured by the most severe crisis that banks and the stock market had ever experienced between 1929 and 1932. This resulted in the imposition of Government controls on the free movement of finance around the world, which made it difficult for both the money and capital market clusters to operate on an international basis.

Both World Wars were exceedingly costly, which meant that Government borrowing dominated the money and capital market in London for the duration of the conflict, forcing out other borrowers. The Treasury bill became the main instrument through which the discount houses conducted their business rather than the trade or finance bill, and this was the situation not only during both wars but also in the intervening years, especially the 1930s. In the capital market, the Government's own requirements overwhelmed all others during both conflicts and were also important between the wars as short-term borrowing had to be re-financed. Furthermore, to obtain foreign exchange, the British Government took control of the foreign securities held by British investors, and sold the most marketable.

By 1945, British Government debt was around 50 per cent of the value of all securities quoted compared to 10 per cent in 1913, while US railways dropped from 18 per cent to 1 per cent. The effect of this was to greatly stimulate the money and capital markets located in New York as they not only captured the US business that had traditionally been done in London, but also attracted custom from around the world.

Under these circumstances, it might have been expected that the City's financial clusters would have collapsed by 1945. However, that was not the case. After 1918 the London money market regained much business from New York and then benefited

82 R Barras, *The Development Cycle in the City of London* [London 1979] p4-5. See R Turvey, 'Office rents in the City of London 1867-1910' *London Journal* 23 (1998)

from the instability of the US banking system in the wake of the Wall Street Crash of 1929. In contrast, the British banking system was largely unaffected by the crash. It did so by maintaining prudential policies on lending and with the support of the Bank of England as lender of last resort. This resilience exhibited by the British banking system, in contrast to failures elsewhere in the world, greatly enhanced its reputation for stability.

Nevertheless, between 1914 and 1945 the UK financial services sector was subjected to challenging conditions and, as a result, underwent a period of change.

In the 1930s, the London money market was at the centre of the most important currency zone operating in the world, namely that for the UK pound sterling. At the same time the money market continued to deliver a mechanism through which banks could borrow from and lend to each other, though now in two ways. The first was the buying and selling of Treasury bills through the discount market with the Bank of England acting as lender of last resort. The second was the development of a foreign exchange market in London. Such was the dominance of the Pound Sterling before the First World War that there hardly existed a foreign exchange market in London. That need arose after the end of the War with the increasing use of the US dollar. Within a short period of time, a foreign exchange market developed in London and it rapidly became the largest in the world, providing evidence of the ability of the money market cluster to regenerate itself (see Table 3.4). Though the level of business done was greatly reduced between the wars, compared to before 1914, the London money market continued to serve a global constituency (see Table 3.5).

Table 3.4: Foreign Exchange Turnover in London and New York, November 1934-June 1939

	London US\$	New York UK£
Total Turnover	16,807 million	1,835 million
\$ Equivalent	16, 807 million	8,800 million

Source: Siepmann Papers, Bank of England Archive

Table 3.5: Commercial bills outstanding in the London money market (Constant Prices 1913)

Year	Total	Domestic	Overseas
1913/4	£518 million	35%	65%
1928/9	£428 million	28%	72%
1936/7	£156 million	48%	52%

Data source: Broadberry, Market Services p270

However, the departure of Britain from the Gold Standard in 1931, removed the currency stability that had been one of London's long standing attractions of as a money and capital market. The instability of the Pound Sterling undermined the attractions of London as a financial centre because of the exchange risks involved, greatly boosting the rival attractions of New York's because of the strength of the US Dollar. At the same time, the high level of personal taxation maintained between the wars, to finance the debt burden, along with the low profitability experienced by once thriving sectors of the British economy, due to a lack of competitiveness, meant that British investors were no longer in a position to fund the purchase of foreign securities at the levels witnessed before 1914.

The London capital market was much reduced in size and scope between the wars for it lost much of its international business. New York not London was the great source of international lending in the 1920s, reflecting the greatly enhanced wealth of the American people compared to the British. What the London capital market continued to do was serve the needs of the British Empire, though even there its reach was limited. The largest imperial borrower before 1914 was Canada but in the 1920s it was now either self-sufficient or looked to New York.

In the wake of the Wall Street Crash, worldwide defaults by borrowers, and the severe depression experienced by the USA in the 1930s, New York's role as the premier international capital market disappeared. However, with the British economy also depressed, and the introduction of exchange and capital controls around the world, international investment operated at a low level in the 1930s. London's capital market cluster turned instead to domestic finance in the 1930s. Issues of domestic securities in London rose from 18 per cent of the total in 1913 to 82 per cent in 1934/8. This was reflected in the importance of such securities on the London Stock Exchange. Between 1913 and 1945 the value of industrial and commercial securities, which were largely issued by British companies, increased from £0.4 billion to £1.6 billion in 1945 and their share of total securities from around 5 per cent to 15 per cent.

What this reveals is that the capital cluster in the City was much less resilient than the money market one. Whatever the monetary, economic and political conditions that prevailed in the world, it remained essential for a mechanism to exist through which debits and credits could be cleared internationally, and London remained best placed to provide that.

CLUSTERS IN CHAINS, 1945 – 1970

By the end of the Second World War, New York had replaced London as the dominant financial centre in the world, located as it was in the world's largest economy, the one with the most important currency, and home to the world's wealthiest people. In contrast, London was located in an economy in decline, the Pound Sterling was an increasingly weak currency, the Empire was disintegrating, and the population was very highly taxed.

In addition, the policies pursued by the British Government, whether at the national or local level, did not support London's recovery as an international financial centre. The maintenance of exchange controls until 1979, even after convertibility between

the US dollar and UK pound was achieved in 1959, made it difficult for London's money market cluster to provide its traditional services for the international banking community. Meanwhile the capital market cluster was prevented from handling issues on behalf of foreign borrowers or from providing an attractive market for foreign securities.

At the local level there was a shortage of suitable property in the City to accommodate those in Financial Services. During the Second World War there had been massive destruction of property due to enemy bombing, with around a third of property destroyed. This was then followed by post-war restrictions on office building in London, including the City, which remained until 1979. The effect was to make it difficult for many businesses that had been displaced during the war to return to the City. This had a very detrimental effect on the City's commercial activities, as it was the City's premises that had been disproportionately destroyed during the war.

With rents rising because of the limited office space available in the City, which did not return to its pre-war level until 1978, many businesses not dependent on the financial sector chose to re-locate. It was in this period that the City began to focus exclusively on financial activities and the support services they required, especially legal and accounting businesses (See Table 3.6). Nevertheless, sufficient office space was provided to meet the needs of those in Financial Services. Commercial property developers became a major force in the post-war re-development of the City, aided by the opportunities created by the bombing to assemble large building plots.⁸³

Table 3.6: Employment in the City of London, 1911-1999

Category	1911	1971	1999
Manufacturing	16.1%	–	–
Distribution	29.0%	8.3%	3.2%
Transport	7.6%	15.5%	4.3%
Printing and Publishing	9.3%	10.8%	0.5%
Professional Services	8.1%	9.7%	32.5%
Banking	3.9%	20.0%	30.2%
Insurance	4.5%	13.9%	5.3%
Finance	5.8%	7.4%	13.5%
Other	15.8%	14.3%	10.6%
Total	343,347	326,400	316,705

Data source: 1911: City of London Day Census, 1911: Report [London 1911]. The grouping of individual trades and professions followed that of 1971 and 1999 but with the addition of manufacturing. The distinction between manufacturing and distribution is somewhat arbitrary as many trades combine both in the classification with many businesses engaged in both the production and distribution of products. This was especially the case for clothing, chemicals, food products and light engineering. (Residents, unclassified and the floating population were excluded.)

1971: R. Barras, The Development Cycle in the City of London [London 1979] p7 (Residual excluded)

1999: J. Simmie, The Changing City: Population, employment and land use change since the 1943 County of London Plan [Corporation of London 2002] p 37

⁸³ J. Simmie, The Changing City: Population, employment and land use change since the 1943 County of London Plan [London 2002] pp36, 54-6, 62; R. Barras, The development cycle in the City of London [London 1979] pp14, 26-7, 59

Despite these difficulties, after 1945 there was an increased demand for Financial Services driven by a prolonged period of rapid economic growth which was creating rising incomes and savings and an increased level of monetary transactions.

Though this increased demand for Financial Services can be seen in the wholesale intermediation index it is not apparent at the retail level (See Table 3.7). The explanation for this is found in the increasing competition experienced by banks from other financial intermediaries. Building societies not only provided consumers with the finance required for house purchase, with home ownership growing rapidly in the 1950s and 1960s, but they also attracted deposits because of the attractive rate of interest they paid savers. As a result they grew into major financial institutions in the post-war years. Banks also lost business to hire purchase companies that provided a specialist service to those buying cars and consumer durables on an instalment basis. Banks were constrained from competing in lending because of controls imposed by the Bank of England, while competition for savings was constrained by the cartel they operated between themselves until the 1970s.⁸⁴

Table 3.7: Measures of Financial Intermediation (1871=100)

Year	Retail	Wholesale
1871	100	100
1880	124	112
1890	152	120
1900	176	102
1910	211	146
1920	130	146
1930	165	179
1940	135	121
1950	126	122
1960	91	250
1970	85	610
1980	209	444

Notes: Retail Index. This attempts to provide a measure of UK financial intermediation at the retail level. It is the ratio of UK gross bank deposits to UK currency in the hands of the non-bank public with 1871 taken as the base year as that is the first date when such information is available. The assumption is that financial intermediation at the retail level would be reflected in a higher ratio of bank deposits to notes and coins. Transactions between savers and borrowers/ buyers and sellers would take place via banks rather than directly using currency.

Wholesale Index. This attempts to provide a measure of UK financial intermediation at the wholesale level. It is the ratio of London bank clearings to gross bank deposits with 1871 taken as the base year as that is the first date when such information is available. The assumption is that financial intermediation at the wholesale level would be reflected in a higher ratio of turnover in the London clearing house to gross bank deposits because of the need to make payments.

These measures are vulnerable to changes in banking organisation and structure, competition from non-bank financial intermediaries, and alternative means of clearing transactions.

Sources: Currency and bank deposits. F. Capie and A. Webber, A Monetary History of the United Kingdom, 1870-1982 [London 1985] pp 130-1, 153-4

Bank clearings. B.R.Mitchell, British Historical Statistics [Cambridge 1988] pp676-7

84 D.F.Channon, The Service Industries: Strategy, Structure and Financial Performance [London 1978] pp72, 78-9; M. Davies, The Origins and Development of Cartelisation in British Banking [Bangor 1993] p34

Apart from Scotland, banking was now undertaken by a small number of City based banks whose customer base grew substantially as more and more people used the facilities that they provided. Thus, the City provided the administrative base for the entire banking system. City merchant banks also re-focussed their business towards the needs of the domestic economy, from handling the investments of pension funds to the conversion of established businesses into public companies, and subsequently mergers and acquisitions activity. Similarly, the members of the London Stock Exchange conducted a largely domestic business in the shares of national companies and UK Government debt, leading to a merger of all UK stock exchanges in 1973. The London money market was also largely dominated by the British Government's own short-term borrowing, with the discount houses acting as the intermediaries between the Bank of England and the banks.

The City's financial clusters also began to recover some international business from the late 1950s onwards. New York had been unable to fully capitalise on the position it occupied after 1945 by building up its own money and capital market structures, mainly because of regulatory intervention by the US Government. These began as efforts to manage the global financial and monetary systems so as to avoid repeating the crises of the inter-war years. Interventions then became attempts to protect the international value of the US Dollar in the 1960s, as balance of payments deficits mounted. The effect was to drive away from New York the financial activities that would naturally have gravitated there because of the importance of the US economy and the US Dollar. As London still possessed a wide range of financial institutions and markets, it was able to take advantage of this situation by offering an alternative to New York. London still possessed an active money market trading Treasury bills and the correspondent banking network was still intact. The relative position of London and New York in 1969 can be seen from the number of foreign banks with offices in each (see Table 3.8).

Table 3.8: Foreign Banks with offices in London and New York, 1969

Region/Country	London		New York	
	Number	Percent	Number	Percent
Europe	24	22%	5	13%
Americas	16	15%	9	23%
Asia	30	27%	19	48%
Africa	4	4%	–	–
Australia/NZ	7	6%	–	–
UK	–	–	7	18%
USA	29	26%	–	–
Total	110	100%	40	100%

Notes: This table only counts those banks that maintained their own branch or office. It excludes indirect or shared representation. Source The Banker, October 1969

However, it was not simply a lack of competition that benefited the London money market cluster. There was also innovation with the development of the Eurocurrency market in which banks from around the world held and traded Dollar deposits located in London. Given the instability of the Pound, banks did not want to convert dollars into that currency because of the exchange risks. Conversely, they did not want to hold the money in New York, where they were subject to controls and interest rate caps. The solution was dollar denominated deposits held outside the USA, and this is what London provided.⁸⁵

This was followed by the development of the Eurobond market. These were bearer bonds denominated in dollars but issued outside the United States and therefore not subject to taxes imposed by its Government. Such bonds were attractive investments to banks holding dollar deposits. It was estimated that 60 per cent of the trading in Eurobonds in 1968 was in London.⁸⁶ Such developments were greatly helped by the lack of controls imposed on dollar transactions in London, as the Bank of England only targeted sterling holdings and UK residents. Thus, the London money market was able to regain its international position because it met a global need. In contrast, the London capital market remained inferior to that of New York, as New York monopolised the domestic business generated by US investors and US companies. This domestic demand in the USA supported a powerful New York cluster consisting of Wall Street investment banks and brokerage houses and the world's dominant stock exchange, the New York Stock Exchange. In contrast, London's merchant banks and the London Stock Exchange was a much weaker cluster as they were dependent upon the business generated by the much smaller UK economy.

CLUSTERS IN COMPETITION SINCE 1970

When the era of fixed exchange rates and central bank controls ended between 1971 and 1973, the London money market cluster was well placed to benefit because it had in place the markets and the connections. In 1973 the Inter-Bank Research Organisation conducted surveys of financial centres, reporting that London '...attracts business because of the range of markets and services that it offers and develops new markets and services because of the scale of business it can attract.'⁸⁷

One of those markets was that for foreign exchange, driven by the instability of major currencies. Daily turnover rose from around \$5 billion a day in 1973 to \$25 billion a day in 1979, with London at the centre of trading. The impediment it faced was the existence of UK exchange controls and these disappeared in 1979. Freed from these restrictions the London money market was able to participate fully in the explosion of inter-bank activity that underpinned the expansion of the global economy after the

85 Annual Review of Foreign Banks in London, *The Banker* October 1968; P. Einzig, 'Dollar Deposits in London', *The Banker* January 1960 pp 23-4; J.R. Colville, 'London: Europe's Financial Centre' *The Banker*, July 1966 p 467, 'Foreign Banks in London' *The Banker* p 943-5, 945

86 G.Dosoo, *The Eurobond Market* [London 1992] pp7-21, 26, 30-3, 176, 206-8; S.Battilossi and Y. Cassis (ed), *European Banks and the American Challenge: Competition and co-operation in international banking under Bretton Woods* [Oxford 2002] pp 210, 213

87 *The Future of London as an International Financial Centre : Report by the Inter-Bank Research Organisation* (London, 1973) Volume 1, p.8

1970s. Between 1977 and 2008 the value of international inter-bank lending rose from \$0.7 trillion annually to reach \$31 trillion in 2008, which was only \$0.1 trillion less than 2007 despite the 'Credit Crunch'.⁸⁸ Though facing competition from other financial centres, especially New York and Tokyo, with their much larger domestic business sectors, the London money market cluster consolidated its position at the centre of these international banking transactions. This can be seen in terms of the number of bank offices in London and New York (See Table 3.9).

Table 3.9: Foreign Banks with offices in London and New York, 1999

Region/Country	London	London	New York	New York
	Number	Percent	Number	Percent
Europe	130	45%	95	36%
Americas	20	7%	37	14%
Asia	107	37%	116	44%
Africa	10	3%	3	1%
Australia/NZ	6	2%	5	2%
UK	–	–	9	3%
USA	15	5%	–	–
Total	288	100%	265	100%

Notes: This table only counts those banks that maintained their own branch or office. It excludes indirect or shared representation. Source The Banker, March 1999 (for NY) and November 1999 (for London)

The presence of these bank offices both contributed to and reflected the strength of London's money market cluster. The London Inter-Bank Offered Rate (Libor), which first appeared in 1986, became the benchmark for the interest charged by banks when lending to each other. Though challenged by Tokyo in the course of the late 1980s and early 1990s, London maintained its position as the most important centre in which such transactions took place (see Table 3.10).

Table 3.10: International Money Market: Relative Shares of London and New York, 1977-2008

Year	Gross Liabilities		
	Total	London	New York
1977	\$0.7 trillion	27.1%	11.6%
1987	\$4.2 trillion	21.9%	12.1%
1997	\$9.1 trillion	19.5%	11.2%
2008	\$31.0 trillion	22.5%	11.0%

Source: Bank for International Settlements, Quarterly Review, March 2009. (External positions of banks: Amount outstanding in each year: US\$ trillion, current values.) National totals are attributed to national financial centres.

⁸⁸ Bank for International Settlements, Quarterly Review, March 2009. (External positions of banks: Amount outstanding in each year: US\$ trillion, current values.) National totals are attributed to national financial centres. The early data exaggerates the role played by London and New York as only a few centres provided data initially. What is important is the relative standing of London and New York. A slightly different figure is obtained if Gross Claims is used.

Providing an even better indication of the central role played by London is money market for international transactions is its position within the foreign exchange market. Daily turnover in the global foreign exchange market grew from \$0.2 trillion in 1986 to \$3.2 trillion in 2007, and London retained a dominant share throughout despite the fact that trading was dominated by transactions in the US Dollar, the Japanese Yen, and the European Euro⁸⁹ (see Table 3.11).

Table 3.11: Average Daily Turnover in the Global Foreign Exchange Market

	1986	1995	2007
Total	\$0.2 Trillion	\$1.2 Trillion	\$3.2 Trillion
London	43.7%	29.5%	34.1%
New York	28.6%	15.5%	16.6%

Source: Bank for International Settlements, Triennial Central Bank Survey of Foreign Exchange Market Activity [October 2001, September 2004, April 2007].

Contrary to the predictions of those who suggested that ultra-fast communications technology would lead to the decline of financial centres the reverse took place. The relative speed of conducting transactions remained important, so even if absolute time taken to conduct transactions fell due to faster communications, those located closest to the market, including an electronic one, benefited because they were able to respond more quickly. Hence the continued importance of the City of London as a centre for money market activity whether it was inter-bank lending or foreign exchange transactions.

In contrast to the money market cluster in London the ending of exchange controls did not provide the capital markets cluster with the same opportunities. Instead, it exposed it to competition from New York, where the ending of fixed commissions on the New York Stock Exchange in 1975 had benefited the large investment banks. When the London Stock Exchange eventually followed the same route in 1986, and also abandoned restrictions on membership, the City's merchant banks, dealers, and brokers found they were no match for their Wall Street rivals, and so most sold out.

By creating a global network of offices, and becoming members of stock exchanges around the world, these New York investment banks were able to offer their expertise and facilities internationally. Given London's existing importance as a centre for capital market operations it quickly became one of the prime locations from which these Wall Street banks conducted their business. This was especially the case when that business was on behalf of European or Middle Eastern business as this was most easily served from a City office.

London also attracted the investment banking business from Continental European banks, with a number buying British merchant banks. Major Japanese brokers also established large operations in the City because of its importance as the leading financial centre in Europe. London's capital markets cluster was further boosted in

⁸⁹ Bank for International Settlements, Triennial Central Bank Survey of Foreign Exchange Market Activity [October 2001, September 2004, April 2007]. The early data exaggerates the role played by London and New York as only a few centres provided data initially.

2002 by the Sarbanes Oxley legislation passed in the USA in the wake of the Enron scandal. This had the effect of making New York a much less attractive place for foreign companies to issue stocks and bonds and have them traded on either the New York Stock Exchange or Nasdaq. Under these circumstances, the London Stock Exchange and especially its market for high risk companies, Aim, were used as substitutes, though the business largely remained in the hands of Wall Street investment banks.⁹⁰

One contribution to the success of the capital markets cluster was the regulatory environment provided in London. This was judged to be much more favourable than in New York, as reported in a 2006 McKinsey Report which stated 'Looking ahead to a world of multiple deep, liquid markets and to companies exploiting the differences between national jurisdictions, the United States simply will not be able to afford some of the more cumbersome and costly aspects of its regulatory and legal system if it is to remain competitive in international financial services.'⁹¹

However, the benefits from more benign regulations were limited because the issue and trading of corporate stocks remained a largely national rather than an international business. This gave New York a permanent advantage because of the size of its corporate sector compared to that of any other country. Despite the collapse in market values in the wake of the 'Credit Crunch' and competition from rapidly growing companies in emerging economies, the USA continued to be the location for the world's largest enterprises, with US firms accounting for nearly half of the top 100 global companies by market capitalisation in 2009 (see table 3.12).

Table 3.12: The World's Largest 100 Companies in 2009 (By market value)

Country	Number	Market Value	Share by Market Value
USA	40	\$3.6 Trillion	43.5%
UK(including dual ownership)	11	\$0.9 Trillion	10.9%
World	100	\$8.3 Trillion	100%

Source: *Financial Times* 30/May/2009

It was the business generated by these companies, and the enormous wealth of the US investing public, that supported the activities of New York's capital market cluster. This can be seen from the relative size of stock exchanges based on domestic market capitalisation (see table 3.13). Whereas that for the London Stock Exchange was 6 per cent of the world total, that for the NYSE and Nasdaq combined was 35 per cent, giving New York a magnitude six times greater than London.

90 H. M. Treasury, UK International Financial Services: The Future [May 2009] pp26-7

91 Sustaining New York's and the US' Global Financial Services Leadership p113

Table 3.13: Stock Exchanges: By Domestic Market Capitalisation (US\$ billion) 2008

Rank	Name	Market Capitalisation	
1	NYSE	\$9,208 billion	28%
2	Tokyo SE	\$3,116 billion	9%
3	Nasdaq	\$2,396 billion	7%
4	Euronext	\$2,102 billion	6%
5	LSE	\$1,868 billion	6%
6	Shanghai SE	\$1,425 billion	4%
7	Hong Kong SE	\$1,329 billion	4%
8	Deutsche Borse	\$1,111 billion	3%
	World	\$33,262 billion	

Source: World Federation of Exchanges, Time Series, 2008

Under these circumstances even the adverse consequences of regulation and litigation was unable to switch the balance in favour of London, apart from those aspects of capital market activity that were of an international nature, as with the Eurobond market. Success in investment banking required a Wall Street presence, showing that the power of the cluster was greater than that of those who used it. A financial cluster cannot be judged in terms of the nationality of those who used it but in terms of the service it provides.

The growing importance of financial and related services after 1979, especially, can be seen in the rapid rise in employment (see Table 3.1). This was a time of very rapid advances in the development and use of information technology in Financial Services, as well as major organisational change involving the creation of integrated banking and broking businesses operating on a worldwide basis from offices in all the major financial centres.⁹² These changes created a huge demand for specialist office space and this met a ready response in London after 1979. That year had not only witnessed the end to exchange controls but also the abolition of the restrictions placed on office building in the City.

In addition, the creation of a regeneration body for the Docklands, which competed with the City in providing offices for financial institutions, forced the City authorities to respond by becoming more liberal in terms of planning regulations. The result was a huge expansion in capacity in London available for the businesses that now dominated the global supply of Financial Services.⁹³

Furthermore, the reduction in personal taxation, and concessions to those whose primary residence was abroad, made the City of London a magnet for those with the requisite talent and skills. By the early 21st century between 10 and 15 per cent of the City's workforce was registered as non-domicile.⁹⁴ It was in the decades after 1970

92 P.W Daniels, *Service Industries: A geographical appraisal* [London 1985] pp 262-270; J. Child and R. Loveridge, *Information technology in European services: Towards a microelectronic future* [Oxford 1990] p83; J.W. Kendrick, 'Productivity in Services' in B.R.Guile and J.B.Quinn (eds), *Technology in Services: Policies for growth, trade and employment* [Washington, DC 1988] p99

93 J. Simmie, *The Changing City: Population, employment and land use change since the 1943 County of London Plan* [London 2002] pp36, 54-6, 62

94 P. Augar, *Chasing Alpha: How reckless growth and unchecked ambition ruined the City's golden decade* [London 2009] p 43

that the City of London emerged as a purely financial centre shedding virtually all activities not related to the money and capital clusters (see Table 3.6). Though attention has focussed on the capital markets cluster, the cluster relating to money market activity remained of major importance and accounted for the presence in London of so many banks from around the world.

3.4 Conclusion

LONDON AS A FINANCIAL SERVICES CLUSTER

Financial Services in the City of London have always been subject to divergent forces. For those directly meeting the needs of consumers the natural tendency is dispersion. In contrast, for wholesale financial services, especially those involving markets, there is a strong tendency for concentration in a particular location.

Dispersion takes place where a financial activity can be most efficiently conducted in a direct contact with a customer and these customers are widely spread. Concentration takes place where the speed of transaction matters as those with the quickest access are advantaged no matter how small the delay is for those located elsewhere. Hence the simultaneous spread of retail banking, as banks sought to service customers through branches, and the concentration of markets dealing in financial instruments, because of the advantages of proximity.

From this arose a small number of financial centres that possessed global importance as they hosted the key markets for all types of financial instruments and acted as points of exchange for the international payments system. London is one of those.

The City of London is often seen as a single financial cluster. This is a mistaken impression. Instead, the City of London is a macro cluster that contains a series of distinct micro clusters. At the beginning of the 20th century the City of London was both a commercial and financial centre, with that involving the organisation and movement of commodities and manufactures being, by far, the largest. By the end of the 20th century that commercial micro cluster no longer existed. It had been replaced by a series of other clusters in which law, accountancy and business were of major importance, while the financial cluster had both grown in size and changed in shape. The purpose of the macro-cluster was, by then, wholly orientated towards finance, whether involving credit or capital, domestic or foreign, retail or wholesale.

FACTORS CONTRIBUTING TO THE SUCCESS OF THE CLUSTER

The success of this macro-cluster was based upon both favourable fundamental features and a continuous adaptation to changing circumstances. The most important fundamental features were economic success and political stability, a legal system that ensured contracts were enforceable but was not litigious, and a regulatory environment that delivered certainty without being intrusive.

The relative decline of the British economy since 1914 removed the basis on which the capital market cluster depended for success. Britain no longer contained a large mass of wealthy people and British business was no longer so successful at home and abroad. As a consequence, the capital markets cluster re-located to New York, which was the financial centre of the 20th century's most successful economy. In contrast, monetary stability, explicit Government support and access to a domestic pool of trained labour were not ultimately crucial factors in the success of a cluster.

In the case of monetary stability and Government support, both these ceased to be factors provided by the UK in any event. The Pound Sterling lost its position as a major international currency and fluctuated in value in the 20th century and the central bank was not always able to act independently. In terms of government support, successive British Governments were either neutral or hostile to the City of London.

The UK continued to produce a pool of trained staff, but as trained and experienced bankers and brokers were mobile and able to flow in and out of the country in response to relative levels of remuneration, this production was not a sufficient condition to keep the cluster here. The establishment of the cluster needed initially to be provided with a large pool of local staff, but ultimately this pool could relocate. In terms of Government policy this means that Government cannot simply establish a domestic sustainable cluster through the training of staff.

Conversely, restrictions on that ability to recruit, whether through controls on immigration, barriers to entry or salary limitations do have the power to undermine a cluster. A similar situation existed in the case of suitable property. Left to itself the cluster's demand for suitable buildings, such as offices and trading floors, was met by the market, whether in the shape of speculative developers or businesses and institutions commissioning custom built premises. As with staff, planning and building controls can undermine the competitive power of a cluster by preventing it developing the buildings it needed and so driving it to locate elsewhere.

In contrast to the capital markets cluster, London's money market cluster proved both resilient in the face of adversity and then recovered when the opportunity arose. The reason for the money market's continuing success in contrast to the relative decline of the capital market cluster is found in the position it occupied and the role it played.

By 1914 the money market cluster had ceased to serve, exclusively, the economy within which it was located. Instead it served the global banking community and was able to continue doing so despite all the difficulties it faced, including two world wars, a series of financial and monetary crises, and international exchange controls. Behind this success lay the maintenance of both the organisation and the links that served it because these allowed the market to re-invent itself over time, as happened with both foreign exchange and Eurodollar markets.

It was most vulnerable during the period of exchange controls which followed the Second World War but it benefited from weak competition, because of the restrictions imposed on New York, and the lack of domestic restrictions on those transactions when carried out in US Dollars for non-British customers. The implications of this is that a cluster capable of delivering long-term success must be one that possesses

unique characteristics that provide it with advantages in meeting the needs of global customers. Once established that cluster must continuously adapt to meet the needs of users and that can only happen if it comprises many different participants that continuously interact.

If the cluster is controlled by a single organisation or business it will possess the power to resist change and so face an eventual challenge, as happened with both individual British banks and, for a period, an institution like the London Stock Exchange. Finally, both the Government and authorities such as the Bank of England and the FSA must recognise that they cannot micro-manage a cluster. The success of a cluster comes from its inner dynamics not from outside intervention and so it must be given the opportunity to respond in its own way to the environment within which it exists. This requires the Government and the agencies that operate on its behalf to be permissive and not restrictive.

If the Bank of England had applied Pound Sterling controls to the use of Dollars in London, the whole history of the money market cluster in post Second World War Britain might have been very different. This does not mean that there is no role for Government to play in the fostering and sustaining clusters. There is, but it is one that needs to be driven by the requirements of those in that cluster, as happened in the period of benign Government neglect before 1914, but which was not the case between 1945 and 1979 when the government actively intervened.

Above all Governments need to be aware of the consequences of taxation and regulation on the competitiveness of the cluster. Governments also need to recognise that clusters require the free movement of skilled labour if they are both to attract in those they require and export those necessary to maintain international links. Finally, Governments need to be wary of either permitting or supporting anti-competitive practices for these can lead the cluster to resist change and so become vulnerable to rivals. It is not inertia but change that has ensured that the City of London's money market cluster is still in place.

3.5 Policy lessons

This paper has examined the history of the UK financial services sector with the aim of identifying policy lessons which can help to shape future sectoral strategies. To reiterate, at a broad level, this paper has highlighted the following:

- The importance of a good general business environment such as economic and political stability, a well functioning legal and regulatory environment, and a flexible labour market should not be underestimated.
- The long term success of the UK's financial services sector has relied on the ability of the sector to continually evolve in response to changing global demands. Regulation in the financial sector in other countries, notably the US did at times stifle evolution. Government needs to ensure that its interventions do not inhibit the ability or incentive for sectors to evolve and innovate.
- Competition is key to encouraging evolution. Government needs to be wary of

either permitting or supporting anti-competitive practices for these can lead the cluster to resist change and so become vulnerable to the actions of rivals. If the cluster is controlled by a single organisation or business it will possess the power to resist change and so face an eventual challenge.

- As clusters tend to encompass a wide range of activities, as in the case of the financial cluster, which also includes law and accountancy, government action to support or stifle any one of these activities could have an impact on the health of the cluster. Clusters therefore need to be broadly defined when government policy is being devised.
- Access to the right mix of skills is essential. London's financial services sector relies heavily on accessing foreign labour through migration. This also enables firms to maintain international links. Restrictions on the ability to recruit, whether through controls on immigration, barriers to entry or salary limitations do have the power to undermine a cluster.
- The London cluster grew organically and was able to generate its own support services, whether in the shape of skilled labour or specialised buildings, if it was given the freedom to do so. The Government and authorities must recognise that they cannot micro manage a cluster. The success of a cluster comes from its inner dynamics not from outside intervention and so it must be given the opportunity to respond in its own way to the environment within which it exists. The Government's most important role in the success of the London cluster has been establishing a stable and supportive business and regulatory environment in which the cluster can thrive.

4. Decline and fall: A history of UK post-war textile production

Chapter authors: Dr Tim Leunig and Dr Kevin Tennent

The views expressed within this chapter are those of the author and should not be taken as Government policy.

4.1 Introduction and summary

The post-war world has seen the invention and adoption of a large number of different synthetic fibres, of which British-invented polyester has been the most successful. This report shows that the invention of polyester did not lead to the creation of a sustainable polyester industry, nor did it revitalise the existing cotton textile processing industry whose machinery could be used to process polyester.

The basic intuition is simple: in a globalised world there is no reason to manufacture in the country of invention. Companies will instead choose to produce in the location that offers the lowest unit costs of production. If Britain is that location, it will be selected as a manufacturing base irrespective of the place of invention, and equally if we are not that location we will not be selected as the manufacturing base even if a product is invented within Britain. Britain may be at the forefront of developing new industries, but this may not necessarily lead to the development of new jobs. In the specific case of polyester ICI did produce polyester after the Second World War, but today polyester is produced overwhelmingly in China and other low-cost countries. In today's globalised economy, it is inconceivable that Britain has any future competing with China in polyester or any other similar manufactured product.

This intuition is not limited to Britain, but instead applies to all developed countries. There are large swathes of manufacturing that are not competitive at developed country wage rates. We need to be very clear about what forms of manufacturing will be successful within Britain. This includes products that are too expensive to transport, because their weight or bulk to value ratio is too high (bricks, plastic bottles). It includes products where the designer wishes to manufacture on site because of feedbacks for the design process (formula one cars). Some manufacturers use the factory location as currency hedging (the volume car industry). Some factories are located for branding reasons (Swiss watches, Rolls-Royce cars). Other products are produced where monitoring is easy and quality control critical (pharmaceuticals, parachutes).

That “new industries” do not lead to “new jobs” is not as pessimistic as it sounds. The price of manufactured goods continues to fall, implying that the share of the

manufacturing value that accrues to consumers as opposed to producers (shareholders and workers) is rising. In that context it is generally better to be a consumer than a producer.

4.2 Definitions and terminology

There are two types of textiles, fibre based, and non-fibre based. Fibre-based textiles include cotton, wool, nylon, polyester etc. Non-fibre based textiles include leather and furs, and are not included in this report.

Fibre based textiles themselves divide into two types, "staple" and "filament". Staple means that the raw material occurs or is manufactured in short pieces. Individual staple fibres must be wound very tightly together ("spun") to make long, strong threads that can be made into cloth. All natural fibres are staple fibres: cotton, for example, is typically around an inch long. The alternative to staple is filament yarns. These are always manmade, and can be produced as fibres of any length and width.⁹⁵ Since the fibres can be made as long as the final item, there is correspondingly no need to spin the fibre, offering a potential cost saving. That said, man-made fibres are now usually produced in staple lengths, and processed like cotton, to give a more natural feel.

There are two principal methods to produce cloth from yarn: weaving and knitting.⁹⁶ In weaving a set of parallel threads is held tight, while another thread is passed across at right angles, alternatively going under and over the parallel threads. Woven fabric is flat, relatively strong and holds its shape well, at the corresponding cost of not stretching (unless the yarn is inherently stretchy – for example, elastic or lycra). Knitting creates cloth by looping a single yarn so that the bottom of one row of loops passes through the top of the loops of the previous row. Knitted fabrics are bulkier and shape themselves both to the underlying shape and to changes in that shape caused by motion. While woven cloth is almost always rectangular, knitted cloth can be made in almost any shape, including tubes (for hosiery), and in three dimensions (such as the heel of a sock). Jackets, shirts and trousers, as well as bedlinen, towels and most household and industrial fabrics are woven. Jumpers, socks, and hosiery are knitted, while dresses, t-shirts, underwear and women's apparel can be either woven or knitted.

4.3 The development of new fibre types

In the period prior to the industrial revolution, transport costs were high relative to production costs and therefore most countries had some sort of indigenous textile industry, using local materials and producing for domestic markets. Britain had a significant woollen industry. Since the industry was relatively autarkic it holds little interest for this study, save to note that it had particularly strong roots in Yorkshire, which persists to some extent to the present.

95 Modern machinery is capable of making extremely fine yarns. Modern microfibre, of the sort used to make dusters and other cleaning cloths, would typically have a diameter of 7 micrometers, that is, 7 millionths of a metre. A kilogram of fibre would be more than enough to reach from London to New York.

96 It is also possible to manufacture cloth without either weaving or knitting – essentially the man made raw material is melted into shape. Bandages are classically made in this manner.

The nineteenth century saw the rise of the cotton industry, which soon located overwhelmingly in and around Southern Lancashire. This industry has much greater potential interest to policy makers. First, that Britain would have any cotton industry is at some level surprising. Britain does not (indeed cannot) grow raw cotton, which came then primarily from the (Southern) US as well as Egypt and India, and now comes primarily from China. Second, the industry grew to a far greater scale than anyone would have predicted. At different points, Britain's cotton accounted for over half of all Britain's exports, for 80 per cent of world cotton exports, and at its peak the industry employed 500,000 people to convert around 1m tons of raw cotton into enough cloth to clothe every person in the world. It is exceptional for any industry to be so dominated by one country. What is particularly remarkable is that cotton cloth is a relatively low value product, sold on price. For Britain to maintain its position until 1913, with some of the highest wages in the world, is evidence of remarkable if surprising success. Third, the industry declined quickly, but not overnight. The twentieth century was a period of remorseless decline, but the industry still took fifty years to disappear, even as wage gaps between Britain and new producers became ever wider. Path dependency and agglomeration economies are important, but they cannot guarantee perpetual success.

The twentieth century saw the invention of, and growth of, three major new fibres: rayon, nylon and polyester.⁹⁷ Rayon, sometimes termed viscose, is a fibre derived from cellulose, principally wood fibres.⁹⁸ Although earlier methods of production exist, commercially successful rayon production began just after 1900 by the British firm Courtaulds, whose origins were as a late eighteenth century silk company.⁹⁹ Rayon can be spun into very long thin threads, and is sometimes termed "artificial silk" for its ability to produce thin, high-gloss fabrics. Although rayon is natural in the sense that it is a plant-based fibre, the fibre has been extracted chemically from the wood. In contrast wool and cotton fibres simply need to be removed to be used. For this reason rayon is usually thought of as a semi-synthetic fibre.

Nylon was the first entirely synthetic fibre, and is derived from oil. It was originally invented and commercialised in the US by Du Pont in the 1930s and licensed in 1939 to British Nylon Spinners, a joint-venture between Courtaulds and ICI. Nylon's use increased dramatically during the Second World War. Its most famous use was in hosiery ("nylons"), but its most important use was to replace silk in parachutes, and was used as a cheap and reliable fabric more generally (unlike cotton there was no danger of the harvest failing).¹⁰⁰ Nylon is strong and resists abrasion and rot, and absorbs only limited amounts of moisture. It can be made into both dull and glossy fabrics. Initial perception of nylon in standard apparel was poor, with issues of breathability. For that reason nylon clothing today is usually labelled "polyamide", an umbrella term for nylon and similar chemical forms. Alternatively, nylon clothing is made out of a branded form of nylon, such as supplex. In general nylon is usually manufactured in staple lengths for apparel. Filament nylon also remains the fabric of

97 Other fibres, such as acrylic (a post war petrochemical textile invented by Du Pont in 1950), used for low-value knit-goods, and polypropylene (1961, also called olefin, and polyethylene) used extensively in car textiles, will not be considered here.

98 Viscose is the more common term, but strictly viscose includes both rayon and cellulose.

99 The process was invented by two British scientists, C.F. Cross and E.J. Bevan in 1892; their patent was bought by Courtaulds in 1904, Owen (1999), pp. 21, 68.

100 Coleman (1980), p. 5

choice when air and water penetration must be resisted (hot air balloons, parachutes, tents) or where abrasion resistance is important (seat-belts, rucksacks). Nylon can also be moulded or extruded for non-textile uses, such as toothbrush bristles, furniture castors, and wallplugs.

Polyester is an oil-derived product that can be made into staple or filament yarns suitable for textiles. It was originally patented in 1940 by the Manchester-based Calico Printers Association, with the US rights sold to Du Pont and the UK and Empire rights to ICI.¹⁰¹ It is now the dominant artificial fabric by some margin.

Polyester offers a number of potential attractions. Unlike cotton it does not hold water, so dries much more quickly from the wash. It also creases much less, and any remaining creases can be removed much more easily. Since it can be produced as long filaments, production costs can be reduced by eliminating spinning. The price of polyester fell dramatically until the early 1970s, by which point it was approximately the same price as cotton.¹⁰² Since then, the prices of both products have continued to fall significantly in real terms – typically 5 per cent per year. Against that, filament produced garments are not well liked by consumers, so polyester apparel is usually manufactured from staple polyester, reducing the cost advantage. Furthermore, the crease-free nature of polyester was perceived to look artificial, and, like nylon before it, polyester clothing had issues related to sweat transmission. For these reasons, polyester has never become the general fabric of choice for consumers in affluent countries, although big advances in moisture control means that “technical polyester” is the fabric of choice for outdoor enthusiasts.

The growth of what are usually termed “technical fabrics” has been dramatic, particularly since their benefits were demonstrated in the conquest of Everest.¹⁰³ Technical fabrics have to offer some combination of water, wind, sun and rot resistance, as well as being breathable, easy to look after, light to carry and durable. Companies such as Karrimor, Rohan, Berghaus, Pertex and Paramo, for example, are all British firms, at least originally, and many originated in Lancashire.¹⁰⁴

Although cotton is an “old” fibre, it has remained competitive in three ways. First, there have been big falls in the price of cotton, matching those of polyester since the early 1970s. Since then the real price of cotton has fallen around 85 per cent.¹⁰⁵ With the rise of China both as a producer of raw cotton and as a low cost centre for cloth and clothing manufacture, cotton has remained price competitive at almost all levels of the market within developed countries.¹⁰⁶ Furthermore, technology has improved for cotton, so that it requires less care and less ironing than in the past. In addition, as society has become more informal, the acceptable standards of ironing have fallen, to the advantage of cotton.

101 Kennedy (1993), p. 81.

102 Baffes and Gohou (2005).

103 Parsons and Rose (2003), p. 216 and elsewhere.

104 Parsons and Rose (2005).

105 Baffes and Gohou (2005).

106 As of today, Asda are selling adult 100 per cent cotton jeans for £2.61 plus VAT and polycotton school shirts for 80p, demonstrating that both natural and man-made fibres are price competitive. Artificial fibre clothing lasts longer, so consumers in poorer countries where clothing durability matters more will prefer polyester or poly-cotton (typically 65:35) to pure cotton.

Wool has not disappeared, indeed its use has increased over time, but has only limited substitutability with other fibres. Wool is used primarily for jumpers, jackets and suits. It is possible to buy acrylic or cotton jumpers and polyester suits, but these are relatively poor substitutes, as evidenced by different price points. Technological improvements in sheep breeding and wool processing have both lowered the price of wool, made it easier to care for (“machine washable wool”), and made it less itchy, all helping to keep wool as a textile of choice for many consumers. Nevertheless its limited substitutability, its relatively small scale, and its status as the least-new industry means that it will not be the focus of this report.

4.4 Global textile production today

Broadly speaking global production of rayon, nylon and acrylic have remained stable for the last twenty five years at around 1, 4 and 3 million tons respectively. Polyester, in contrast, has increased from 5 million tonnes to 25 million tonnes.¹⁰⁷ While polyester used to be produced in developed countries, newly-industrialised countries such as Korea and Taiwan entered the market, and more recently China has become the dominant producer. Today China produces more than half of the world’s polyester, while Europe produces less than 5 per cent.¹⁰⁸ Cotton production is also broadly stable, at a level similar to current polyester production.¹⁰⁹

UK TEXTILE PRODUCTION TODAY

The UK industry currently has value-added of £0.6bn, employs 19,000 people, has a wage bill of £0.4bn, and correspondingly an average salary of £22,100.¹¹⁰ To put this in context, the textile industry employed 1.2m in 1904, so there has been a 98.5 per cent fall in employment over the last century. The past 12 years have seen the industry continue its sharp contraction. In real terms, value-added has dropped 69 per cent and the wage bill has fallen 66 per cent. The number employed was not recorded for 1995, but has fallen 68 per cent since 1998. Total net capital expenditure, at £73m, was 91 per cent lower than in 1995. The industry, on any definition, is small scale, has low productivity and is in rapid decline.

At first sight the Balance of Payments position has improved, with a deficit of around £1bn in nominal terms in the early 1990s falling to a deficit of £125m in 2008, a 93 per cent fall in real terms. However this reflects the fact that whereas we used to import yarn for weaving, and cloth for manufacturing clothing and other textile items, we now import textile items fully finished from elsewhere. As such, although the imports of cloth appear to be falling, they are not actually falling, but rather are being imported assembled as clothing and other items. The overall textile deficit has increased from £3.1bn in 1990 to £10.7bn in 2008 in nominal terms, a doubling in real terms.

In short, Britain today appears to have no ability to produce mass-produced textiles competitively and the remnants of the industry are shrinking accordingly.

¹⁰⁷ American Fiber Manufacturers Association online statistics; Kin-fan and Man-chong (2006).

¹⁰⁸ Kin-fan and Man-chong (2006).

¹⁰⁹ Cotton Incorporated (2009).

¹¹⁰ Annual Business Enquiry subsections DB 17.1, 17.2 and 17.3 combined, which covers the “Manufacture of textiles:

4.5 When did it go wrong?

As we noted above, the textile industry peaked in 1913, when more than 500,000 people were employed to process over 1 million tonnes of raw cotton. But the invention first of rayon and later of polyester made it plausible that decline could be arrested or even reversed, at least in terms of output or value added (it is not plausible that half a million people would remain employed in textiles in a country such as Britain). The critical decades were the 1950s and 1960s, because this is the period in which any turnaround in the industry's performance generated by new fibres would have been seen. In 1951 textiles accounted for 12.2 per cent of manufacturing output, and employed 12.9 per cent of manufacturing labour, implying labour productivity equal to 95 per cent of the manufacturing average. Given that the industry was not particularly capital intensive, this appears to be a creditable performance. But by 1972, the sector had fallen to 5.9 per cent of manufacturing output, although it still employed 7.6 per cent of manufacturing labour, implying that productivity had fallen to 82 per cent of the manufacturing average.

Within the textile sector, man-made fibres rose from 61.5 per cent to 82 per cent of output, with employment in the man-made sector rising from 59.5 per cent to 78 per cent of total textile employment. This implies that productivity in the man-made sector rose from 9 per cent above that in the cotton sector, to 28 per cent above. Even so, productivity in the man-made sector was still 14 per cent below the average in manufacturing industry in 1972. The man-made fibre industry was successful only within the context of the rapid decline of the textile sector, and should not be seen as successful in the context of British manufacturing as a whole in the post-war era, when judged either by output, or by productivity.¹¹¹

The immediate post-war period saw action to try to address both weak-demand and over-capacity on the supply side. Although the Attlee Government decided not to nationalise the industry, it did use the 1948 Industrial Development Council Ordinance to create the Cotton Board, one of four statutory Industrial Development Councils created in this era.¹¹² The Board had the right to impose a levy on all British cotton firms, with the money being used for research and particularly for marketing. The underlying rationale was one of market failure: were any one firm to have advertised British cotton goods, all other firms would have been able to free ride on the increased perception of British cotton goods, as such no firm would advertise, a classic case of market failure which can be overcome by compulsion. (Today the Potato Council has much the same rationale, and uses the revenue from a levy of £39 per hectare on growers, and 17p per tonne on buyers). No equivalent body was created for artificial and mixed fibres, as it was felt that these were generally produced by companies whose market share was sufficiently large to reduce the free-riding issue to acceptable levels. Cotton Board "Buy British" marketing was unsuccessful – partly because the industry could not agree on what counted as British cotton, with spinners believing that where the cotton was spun was crucial, while weavers held that foreign spun, British woven cotton was sufficiently British to qualify. Against that, one merchant, G.D. Hughes, told the Cotton Board in the mid-1950s that "There was no evidence that

¹¹¹ Miles, p. 185.

¹¹² Clayton, p. 8.

the consumer had any preference for UK produced cloth", before going on to argue that "there was no evidence that imported cloth was inferior in quality to home produced cloth, in fact it was very often of better value and often too of better quality".¹¹³ This serves to emphasise the fact that the traditional cotton industry had no future within the United Kingdom: it was either going to contract to a niche sector, or require new approaches, or new fibres, to compete.

The realisation that some sections of the market had been lost for good became more established as the 1950s wore on. As a result, in 1959, The Cotton Industry Act set out to help the industry to adjust to new conditions in which imports would remain an important part of the market. The White Paper that underlay the act stated that the aim was "to bring about a reorganised and re-equipped industry that could compete with success in the markets of the world with the types of cloth that wanted wherever living standards are high."¹¹⁴ As Miles notes, "for all its deficiencies, the Act was possibly the most elaborate and costly adjustment assistance programme limited to a single industry".¹¹⁵ In keeping with the intellectual atmosphere at the time, no attempt was made to justify these actions using arguments concerning market failure. Nevertheless, if the intellectual atmosphere had been different, arguments based on theories of market failure could have been advanced to defend the decisions that were taken. In particular, the main aim of this and other textile assistance programmes in the 20th century was to reduce capacity. Underlying this was a belief that good firms could earn a commercial rate of return were it not for the fact that there existed a tale of low productivity firms who had access to machinery that had already been written off. Such firms listed the creation of what was sometimes termed "disorderly selling" or the creation of a "disorderly market". A simple economic world, of the sort found in any introductory textbook, is not characterised by sunk costs. Instead, firms make decisions as to the amount of capital and labour that they wish to employ moment by moment. In essence, neither capital nor labour is long-lived, but rather can be created and abolished instantly. For that reason, scrapping schemes could be conceptualised as bringing the industry closer to the economics 101 paradigm, in which capital is not long-lived, and as such could be seen as correcting rather than distorting a market that is currently distorted by a legacy of previously purchased capital equipment.

The Act aimed to scrap 50 per cent of spindles, and 40 per cent of looms, and records of plants scrapped shows that these figures were almost reached. Against that, much of the machinery that was scrapped was "very old machinery, most of it worthless anyway".¹¹⁶ Employment fell by a considerably lower amount, adding evidence to the notion that most of the machines that were scrapped, had only been nominally in use beforehand.¹¹⁷

Having noted that the money was spent as it was intended, the Estimates committee of the House of Commons reported that "It is no part of the duty of Your Committee to comment upon the policy which underlies the Act. Nevertheless they feel bound to

113 Clayton, p. 21, from Cotton Council minutes.

114 quoted in Miles, p. 189.

115 Miles, p. 192.

116 Textile Council, p. 120, para 576.

117 Miles, p. 192.

record their conviction that, failing a speedy and satisfactory solution to the related problems of imports, marketing, and the fuller use of plant and machinery, much of the expenditure incurred will have been to no purpose".¹¹⁸ Although the report did not contain a cost-benefit analysis, there is a strong sense from statements such as this, that the benefits were zero. Competition from foreign countries, particularly those characterised by much lower wage costs, continued to be able to produce textiles at lower cost, and as such scrappage schemes served no purpose, and inducing further innovation represented a misdirection of resources within the economy. Thankfully levels of new investment were low and, as Miles notes, "the relatively low level of investment was possibly fortunate, in view of the Lancashire industry's rapid decline during the next decade."¹¹⁹

That decline is evidenced in table 4.1, which sets out the production, imports and exports of textiles in Britain, 1957 to 1967.

Table 4.1: The UK market for cotton and man-made fibre fabrics

	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967
Prod	2629	2290	2219	2204	2126	1864	1823	1871	1901	1779	1484
Imp	490	434	575	787	801	642	699	860	676	680	784
Exp	567	468	412	381	336	290	290	300	300	232	209

Million square yards

source: Textile Council, 1969: appendix IV, p. 147

Table 4.1 shows output declining by 43 per cent, exports declining by 63 per cent, while imports rose by 60 per cent. At the beginning of the period export still exceeded imports by 16 per cent, whereas a decade later imports exceeded exports by 275 per cent. This was an industry in dramatic decline. Innovations that would ultimately be successful at a technical level, such as the introduction of "Dorma" polycotton sheets by Viyella in February 1968, were not particularly profitable, and did not lead to sustainable employment.¹²⁰

Yet for all this continued decline, the textile industry remained the remarkable focus of Government interest. Partly this is because the workers were generally older, and were seen as having no transferable skills. Thus although unemployment was low in this era (including in the Lancashire textile districts), there was a fear that the workers in this industry would not readily be able to find work elsewhere.¹²¹ Keesing and Wolf, writing in 1980, note that while textile and clothing output made up just 7 per cent of manufacturing output in developing countries, as a whole, it accounted for 14 per cent of manufacturing employment.¹²² They went on to argue that the 1970s had seen dramatic changes in the relationships between developed and developing countries. The first, the relative rise in the price of oil has clearly been bad for developed

¹¹⁸ House of Commons, fourth report from the Estimates committee, session 1961-62, assistance to the cotton industry, quoted in Miles, p. 192

¹¹⁹ Miles, p. 191.

¹²⁰ Hyde, p. 9

¹²¹ Textile Council, p. 176, Appendix XXVI

¹²² Keesing and Wolf, p. 1

countries that did not have oil. The second, the fall in the relative price of labour intensive manufactured goods, such as textiles, should have been good both for developed countries (which could now consume such goods at lower cost) and for developing countries (which could now develop by producing such goods). Keesing and Wolf argued that developed countries fail to see that whilst one of these changes did indeed make them worse off, the other one made them better off, and instead treated them both “as almost equally inconvenient”.¹²³

4.6 Questions and approaches

If we take ourselves back to 1945 it is possible to imagine a bright future for the textile industry. Britain had the highest skill textile operatives in the world, both in the Lancashire cotton industry and in the Yorkshire woollen industry. We also had a first class textile machinery sector, exporting cotton processing machinery in particular around the world. We had invented both rayon and polyester and had two large companies – Courtaulds and ICI – with sufficiently strong research and development backgrounds in chemicals to be plausible candidates to lead these industries in the manner of Du Pont in the US. Today as we have noted, the textile industry is small and continues to decline. This begs the question: did postwar Britain fail, or was this inevitable?

The question of whether Britain failed has been asked for many sectors, and for the UK economy as a whole. Even when we take into account that other countries had more potential to “catch-up” in the post-war era, there is a clear statistical basis to support the notion of failure in this period.

There are a number of schools of thought that try to explain Britain’s lack of success. The first, associated with Harvard Business School Professor Alfred Chandler holds that Britain had too many small, atomistic, family owned firms, and did not successfully embrace the sort of managerial capitalism and mass production that many believe led to US productivity dominance in the mid-twentieth century.¹²⁴ Some aspects of this approach have recently been given a boost by the work of Bloom and co-authors.¹²⁵

The second approach, associated with Steve Broadberry and particularly Nicholas Crafts, argues that Britain failed because levels of competition were too low.¹²⁶ Although there were often many firms, cartelisation and collusion meant that competitive pressures were low (Crafts, 2010 forthcoming). Bad firms were able to survive for too long. Again, this receives support from recent work by Aghion and co-authors, and Nickell.¹²⁷

A third approach argues that Government got it wrong. Proponents of a Japanese MITI-approach argue that Government was too weak, while more free market types argue that it was too strong. Others argue that it was not the level of Government intervention, but its effectiveness. They point to issues such as regional policy, education and skills, and trade union reform.

¹²³ Keesing and Wolf, p. 177.

¹²⁴ Chandler (1990).

¹²⁵ Bloom et al (2007).

¹²⁶ Broadberry and Crafts (2001), Crafts (2010).

¹²⁷ Aghion et al (2005), Nickell (1996).

A fourth approach, common in the business history literature, argues that British managers failed to be successful managers and entrepreneurs. The possibilities were there, but managers failed to grasp them. Many managers are seen as backward looking, focussing on the empire, for example, rather than on richer markets in Europe. ICI has been criticised on these grounds.

A final approach is to argue that the decline of individual sectors is simply part of the "international product cycle", that is, as other countries industrialise they take on the simplest, lowest value-added sectors for which low wages are a powerful competitive advantage. Richer, developed nations, in turn move towards higher value-added sectors. Textiles are a low value-added sector, and Singleton in particular has argued that Britain would have done better to have closed down the textile industry much more rapidly in the post-war Golden Age 1945-73 when other jobs (often better paid) were plentiful.¹²⁸

4.7 Some answers

WERE BRITISH FIRMS TOO SMALL?

Authors such as Lazonick, writing in the tradition established by Alfred Chandler, have argued that the British cotton industry suffered from having too many small firms.¹²⁹ Certainly the 20th century has seen a rise in the number of large firms, and in the concentration ratio, which suggests that those who argue in favour of greater scale have history on their side.¹³⁰ Against that, there is evidence that rises in concentration were fastest in industries in decline, and that small firms had generated global leading productivity rates in aggregate at the start of the century.¹³¹

Between 1939 and 1965, a share of the cotton industry accounted for by the largest firms grew substantially, with a significant rise in vertical integration.¹³² The 1960s saw a large number of mergers, so that concentration in textiles rose faster than any UK manufacturing group other than the drinks industry between 1957 and 1969.¹³³ By 1968 the five largest firms accounted for between a third and a half of the various sections of the cotton industry. These firms were much larger than any estimate of the minimum efficient scale.¹³⁴

It is worth commenting on the role of Courtaulds and ICI. By the post-war period both firms were producing significant quantities of man-made staple fibres, rayon and polyester. Since staple fibres are "spun as cotton", both therefore required markets for these fibres, and the obvious market was the existing Lancashire textile industry. Thus the health of the Lancashire cotton industry was critical to the survival and prosperity of Courtaulds and ICI.

¹²⁸ Singleton (1991).

¹²⁹ Lazonick (1990).

¹³⁰ Hannah (1983).

¹³¹ Curry and George (1983), Leunig (2003).

¹³² Singleton (1991), pp. 213-5.

¹³³ Singleton (1991), p. 217.

¹³⁴ Pratten (1971) p. 238.

Seeing its customers gradually disappear, Courtaulds proposed what became known as the “Northern Project”, in which it would merge with or take over five of the largest spinning firms. This was strongly supported by Government, who saw man-made fibres as offering a bright future for Lancashire, although no Government money was involved. ICI, which had recently failed to takeover Courtaulds but remained a major shareholder, was concerned that it would lose customers, and insisted on a 45 per cent share of the new entity. The project collapsed when ICI and Courtaulds could not agree terms with the fibre processing companies. After that, both Courtaulds and ICI took over a large number of cotton firms, Courtaulds in full, ICI by minority stakes. As Edmund Dell, later a trade minister, remarked, Courtaulds “possessed a long list of textile companies that were queuing up to be taken over”, although as the Economist noted, “Courtaulds gets the worst companies in the worst sectors”.¹³⁵ The company ended up controlling around 30 per cent of the Lancashire spinning industry by 1968. This process was welcomed by the Wilson Government and only stopped when, following a Monopoly Commission report critical of the extent of Courtaulds dominance, the Board of Trade prevented further expansion. Against that, Hannah and Kay remark that “Anyone who believes that the British textile industry is in danger of successful monopolisation cannot see beyond the Straits of Dover”.¹³⁶ ICI-owned firms in particular were substantially rationalised and modernised, although Courtaulds pursued more of a traditional holding company approach. Even then, Courtaulds invested £57 million in new plant and equipment between 1962 and 1969, with corresponding levels of closure of older mills. Neither concentration, scale nor vertical integration helped. Courtaulds profit rate fell dramatically, from 14.6 per cent of sales in 1964 to 6.7 per cent in 1972. Having noted the genuine efforts to reorganise and re-energise the sector, Singleton notes that “hard work did not guarantee success and the industry remains uncompetitive in world markets.”¹³⁷

The problems appear to have been twofold. First, many of the firms acquired by Courtaulds and ICI did not purchase filament yarn from Courtaulds and ICI, preferring instead to purchase fibre from the cheapest supplier. As such, the policy was not always successful even in the short term. Second, the Lancashire textile industry was in decline for exogenous reasons, and being taken over by Courtaulds or ICI did not alter this fact. As such, the policy of takeovers was not sustainable even had it been successful in the short term.

Nor was it the case that smaller firms disappeared faster than larger firms during the Lancashire textile industry’s decline. Indeed, the average size of cotton firms has declined as the industry has disappeared. In 1950, the average British cotton firm employed around 200 workers, whereas by 1992 the typical British cotton firm employed an average of 65 people per establishment, falling further to 53 people by 2007. Rationalisation, scale and modernisation did not prove to be an effective way forward for this industry. The underlying rationale for Government supported intervention by companies such as Courtaulds and ICI was fundamentally flawed. Despite its earlier spectacular expansion, Courtaulds was finally split up in 1989, while ICI also demerged, and both have since been taken over.

¹³⁵ Singleton (1991), pp. 222, 226.

¹³⁶ Hannah and Kay (1977), p. 46.

¹³⁷ Singleton (1991), p. 225.

The production of man-made staple fibre exhibits much greater economies of scale than the processing of the resulting fibre into yarn and cloth. In 1950 there were 20 establishments in the synthetic fibre industry, employing an average of just over 1600 people per plant. Even here, however, we should not overstate the benefits of economies of scale. By 1990 there were 26 establishments in the industry, but employment had fallen to just under 300 employees per plant. The replacement of labour with capital explains much of this fall. Since then many of these establishments have stopped producing textiles: the Courtaulds factory in Spondon near Derby, for example, now produces acetate wrappings for, for example, the food industry (such as the clear “windows” on the top of boxes used for cakes and doughnuts), while the former Courtaulds factory at Grimsby now produces the filament precursor from which carbon fibre is manufactured.

Thus we find that path dependency means that a limited proportion of former rayon and polyester production sites are still in use, and employment levels are relatively low. Here there is a contrast with the more recent “technical” textile sector. For example, Karrimor, one of the market leaders in outdoor gear until the late 1970s employed only 300 people in its two Lancashire factories in 1974. Today I am unable to find any UK outdoor gear company that produces either the fabric or final items within Britain. It seems likely that most firms source their clothing in China, Vietnam and other similar places for cost reasons, although some firms produce abroad for explicit social aims: Paramo, for example, manufactures all of its garments in Colombia, in a factory that explicitly aims to provide jobs for women and children who have no other employment opportunities except prostitution.

WAS COMPETITION TOO WEAK?

As we noted earlier, Crafts and others have claimed that low levels of competition in the British economy in the post-war era reduced UK productivity growth and thus worsened UK standards of living. There is good evidence to believe that this hypothesis is valid in many sectors, but we need to be careful in how we apply it to the textile industry. Notwithstanding the degree of mergers and acquisitions in the spinning and weaving industry, there remained high levels of competition: the initial degree of atomisation ensured that there were substantial numbers of competing firms within Britain until the industry finally collapsed.¹³⁸ Against that, restrictions on imports from India, Pakistan and Hong Kong were put in place in 1958, and became more restrictive after Britain joined the European Union in 1973. Here Britain was relatively unique in exposing its domestic industry to international competition in the immediate postwar era. In 1960, imports made up 35 per cent of domestic textile consumption in the UK, compared with 5 per cent in the EEC-6, and 1 per cent in the US.¹³⁹

In contrast, there were clearly much lower levels of competition in the man-made fibres sector. Higher levels of economies of scale meant that it was not feasible to have an atomised industry. Equally, the UK market for rayon, nylon and polyester was relatively limited and therefore competition between domestic producers would

¹³⁸ Marrison, Broadberry, Leunig (2009)

¹³⁹ Owen (1999), p. 67

always be limited. As such, competition has to be via imports. Here we need to make a big distinction between the period before we joined the European Union, and the period after we joined the European Union, with competition clearly stronger in the latter period. Nevertheless, until 2005 textile industries in all developed countries received some protection from the Multi Fibre Agreement, which limited the export of textiles from many developing countries. Looking back, the extent to which British textile firms were domestically oriented is in many ways remarkable. As late as the mid-1980s, 90 per cent of Courtaulds textiles were made in Britain, and 90 per cent of sales were in Britain.¹⁴⁰ This, then, was a much more domestically oriented industry than say the car industry. But although we can imagine that the British car industry might have responded successfully to high levels of competitive pressure from car firms in neighbouring European countries, it is not easy to imagine the high wage British textile industry responding to competitive pressure from very low cost Chinese firms.

DID GOVERNMENT GET IT WRONG?

In general, Government intervention in the textile industry was not helpful. In 1943 “The Cotton Board Committee to Enquire into Post-War Problems” came up with a unanimous finding that the industry could prosper only if the Empire market was protected, at the expense most obviously of India and Japan.¹⁴¹ The British Government was unwilling to do either, and in this at least its response was appropriate. In 1944 the Cabinet Reconstruction Committee rejected proposals from Hugh Dalton, President of the Board of Trade, for compulsory mergers.¹⁴²

In 1945, Cripps, President of the Board of Trade, set up a working party consisting of employers, unions and external experts, a model he saw as applicable to all industries. Although uncontentious items – such as asserting a bright future for the industry – were unanimous, other sections were not. The unions, for example, supported nationalisation, and Jewkes, a leading independent commentator, along with some employers wrote a dissenting report advocating a more free market approach. The result was the 1948 Cotton Industry (Re-equipment Subsidy) Act, which offered 25 per cent subsidies for new equipment, but only subject to amalgamation to at least 500,000 spindles, and a move to shift working. Take-up was less than one-quarter of the £12m allocated, with firms (rightly) fearing Japanese competition. As Singleton notes, “Labour’s plans for the reorganization and revitalization of the cotton industry during the mid-1940s ended in abject failure.”¹⁴³ Take-up was similarly low for Macmillan’s 1959 Cotton Act that was similar in design: subsidies for re-equipment and amalgamation.

The 1960s also saw the Government encourage the construction of large conglomerates covering many aspects of the textile industry, and based around Courtaulds and ICI. As we have noted, these did not prove to be successful. Owen in particular highlights how the decline in textile industries in other European countries was much more market-led. Although German firms, for example, also made

¹⁴⁰ Owen (1999), p. 79.

¹⁴¹ Singleton (1991), p. 27.

¹⁴² Singleton (1991), p. 28.

¹⁴³ Singleton (1991), p. 35.

mistakes in responding to competition, for example by investing in capital intensive mass production strategies, these mistakes did not persist for as long because the market exercised greater control over the allocation of capital.¹⁴⁴

The British Government also had a significant effect on the location of new factories. Courtaulds, for example, wanted to expand production at or around its Flint site, but were prevailed on to build new factories at Carrickfergus in Northern Ireland, Preston in Lancashire, and Grimsby in Lincolnshire.¹⁴⁵ Similarly, British Nylon Spinners had started production during the war in Coventry and Stowmarket (the latter apparently selected to avoid bomb damage). After the war they wanted to consolidate production in a site in the Midlands, but the Government insisted that they had to build in a development area. The factory ended up at Pontypool, and suffered difficulties with recruitment and training. The company ended up having to run regular buses from the surrounding area in order to find the relevant number of employees. The factory location was particularly unhelpful given that it was designed to use supplies for ICI's polymer factories in Billingham in Teeside and Huddersfield. Indeed, significant investments were made at the same time by ICI in Billingham and British Nylon Spinners in Pontypool. In 1957, British Nylon Spinners converted a former rayon factory at Doncaster to give them a location close to ICI, but it is hard to see Government involvement and regional policy as anything other than harmful to the performance of the company.¹⁴⁶ Government was also involved in Courtaulds construction of new factories in Carlisle, Workington and Skelmersdale, none of which were obvious locations, and forcing Pasolds of Langley to move away from its south of England base. This inability to expand was typical of an era in which factory expansion in economically successful areas needed an "Industrial Development Certificate", which were by no means always available: in the mid-1960s as many as 30 per cent of applications were turned down, and many more potential applications were presumably not made by firms who knew that their applications would not be successful.¹⁴⁷ This had the effect of reducing internal economies of scale, reducing agglomeration economies, and worsening supply chain conditions.

WERE FIRMS AT FAULT?

There is much evidence of entrepreneurial success and entrepreneurial failure in this sector. The original textile industry was clearly built up as a result of entrepreneurial success of a large number of millowners. The initial invention and commercialisation of both rayon and polyester are also signs of entrepreneurial success. But in the post-war era it is hard to escape the conclusion that the most successful entrepreneurs in the British textile industry were those who decided to use their existing machinery until it wore out and then to leave the industry. Not one of the major post-war reorganisations has stood the test of time. Equally, more recent entrepreneurial successes in the outdoor fabric market have not been based on producing textiles or finished products in Britain. Given that there is no major textile industry in any other European nation, it seems most unlikely that better entrepreneurship would have dramatically changed the course of this industry's decline.

¹⁴⁴ Owen (1999), p. 85.

¹⁴⁵ Coleman (1980), pp. 42-48.

¹⁴⁶ Hague (1957), pp. 100-4.

¹⁴⁷ Scott (2004), p. 359.

IS IT SIMPLY A PRODUCT CYCLE STORY?

There are many reasons to think that the product cycle history of the British textile industry is the most compelling. Evidence for this comes in a number of forms. First, we note the huge diversity of approaches pursued within the British textile industry. On the one hand we have small scale traditional firms, spinning or weaving cotton, staple polyester and/or staple rayon, which have not survived. We also have large scale integrated spinning and weaving firms, which have not survived. Courtaulds and ICI developed into large conglomerate firms with extensive vertical integration and the ability to gain economies of scale: they have not survived. When so many approaches have failed, it is at least plausible that the reasons lie outside the industry.

Evidence for the product cycle hypothesis can also be seen if we look internationally. The European industry declined more slowly than the British industry in the post-war era, but has also ended up relatively small. By the mid-1990s, the German and French industries were three to four times the size of the British, while the Italian industry was eight times the size. Nevertheless, given the very small size of the British industry the difference in employment levels between these countries in absolute terms would have been relatively slight.¹⁴⁸ The textile industry of all of these countries is in decline, and it seems unlikely that textile production in any of these countries will continue to any extent in the future.

We can see the same if we look at the history of ICI. ICI made significant profits in nylon and polyester in the 1960s, but these disappeared as the global prices for these products fell from 1970 onwards.¹⁴⁹ Prices fell from the 1970s onwards with the development of the global economy. It is a simplification but not an error to say that much of the globalisation that we have seen in the last 25 years has been based on companies finding cheap labour locations suitable for producing relatively simple goods that can be sold on price. Much of manufacturing has fallen into this category, and today almost all textiles are manufactured in low-cost countries. You will be shown the door if you walk into a posh shirt shop in Jermyn Street, whose shirts say proudly on the label “Made in England”, if you ask them where the actual cloth was made!

4.8 Policy conclusions

The textile industry yields particularly useful insights into the types of industries in which the UK is likely to enjoy growth opportunities in global markets. It is quite clear that a Government engaging in any “new industry, new jobs” exercise in 1945 may well have highlighted the textile industry as a likely success in the future. It has all the right elements: a significant skill base in the region with lower than average prosperity, high levels of skill both on the shop floor and in research, and the prospect of new and expanding markets both at home and abroad.

Any Government committed to “a new activism” might well have believed that “a joint partnership between business, Government and our wider society” would be successful in this sector. Government involvement in the post-war textile industry

¹⁴⁸ Owen, (1999), p. 83

¹⁴⁹ Owen (1991), p. 81

was largely in line with a number of the aims set out in NINJ (section 6.5), "What the approach defined here does not involve is national ownership of industry, the picking of national winners, the revision of European state aid rules or the erection of trade barriers. It does not involve distorting resource allocation in an inefficient way or displacing creative private enterprise. It recognizes that while a role for Government in working with the private sector to build our competitive future is necessary, that role also has important limits."

That the Government's post-war approach to textiles failed to lead to the continuation of a sector of the magnitude enjoyed in 1945 can be explained by the fact that the invention of a product, or even a new manufacturing process, does not in any sense guarantee that it will be produced in the country in which it is invented; while rayon and polyester were invented in the UK, the long-term location of production was dependent upon relative of production costs.

The reason for this is simple, unambiguous and will apply to many sectors: wages are dramatically lower in China and other developing economies than Britain, and, once production requirements for a product move away from the technology frontier, this will, in many cases translate to lower production costs even once transport costs are taken into account.

In this context it is helpful to identify the factors that are most likely to require production to be based in Britain:

- **Goods with a short shelf life.** This category actually extends quite widely and beyond the obvious food-stuffs, e.g. bread. For example, a combination of surprisingly rapidly changing fashion, the need for the product as soon as possible, the need for assured quality, short production runs and a willingness to pay at the margin mean that significant sections of UK textiles industry – e.g. bridal and carnival lace survive against competition from lower wage economies.¹⁵⁰
- **Products which would be damaged in transit.** Glass is frequently produced in the country in which it is going to be used, but this also extends to products for which shorter travel distances reduce the risk that a "clean" product will be damaged in a way that makes it unsuitable for use, e.g. food wrapping.
- **Products that have a very high weight to value ratio, such as bricks, cement and products that have a very high bulk to value ratio,** of which the most relevant example here is plastic bottles. Empty plastic bottles take up a great deal of room. As a result, they are almost always produced relatively close to where they will be filled. Prodcom statistics record that in the last year for which data are available, 2007, Britain produced 18.8 billion plastic bottles. These products are barely traded: Britain exports 5% of the bottles that it makes, and imports bottles equivalent to 10% of domestic production. The cost of transporting such goods around the world exceeds the labour cost saving from making them in a low-wage country. Again, the effect is that producers of these products enjoy significant levels of natural protection.

¹⁵⁰ I am grateful to participants in this sector for explaining the sources of their competitive position to me.

- **Goods for which being produced in Britain is an innate part of the product.** It may well be that a Korean produced Rolls-Royce would be just as reliable as and significantly cheaper than one that is produced in Britain. Nevertheless the brand image of a Rolls-Royce requires that it is built in Britain (almost) irrespective of the underlying cost structure. However, we should not overstate the extent to which this is true. Although customers may care about the location of a Rolls Royce's final assembly, there is no evidence that they care about the country in which its components are produced. While Japanese car firms advertise that they produce cars abroad: their reputation for reliability is based on production techniques and management style, not the location of production.
- **Goods where the consumer, rightly or wrongly, believes that it is less risky to use a locally produced good.** It is not difficult to imagine customers being prepared to pay a premium for a parachute produced in a high wage economy. In addition, strategic considerations mean that Britain buys military parachutes from British firms, ensuring that Britain has a parachute manufacturing industry that can also produce civilian parachutes.¹⁵¹ The same is true for pharmaceuticals, and civil aeroplanes. Here production in a developed economy should be seen as a type of insurance.

This also extends to a handful of more mundane goods. Miele, the German domestic appliance manufacturer, continues to produce all of its appliances in Germany, and almost without exception uses German components, even to the extent of producing its own nuts and bolts now that it is hard to source these from within Germany. This clearly raises the cost of production, but this is a firm that competes primarily on its reputation for reliability. The evaluations by Which? magazine suggest that that reputation is well founded. The UK bike company, Brompton, have advanced a similar argument for maintaining UK production, as well as stating that observing the production process allows them to make incremental changes to product design.

- **Products where design continually evolves.** Formula 1 cars would be a classic example, but complex machine tools would be another. The successful military optics cluster in North Wales would be a good example of this working well within Britain.¹⁵²

In summary, competition from low wage economies is likely to continue to act as a constraint on the proportion of British GDP that comes from manufacturing. However, a number of areas can be identified where manufacturing is likely to remain in the UK.

In terms of the development of sector policies once a sector has been chosen, the insights from textiles are perhaps less obvious. However, experience from textiles appears to suggest that rather than focussing on specific products or technologies, Government is likely to do best to concentrate on the most fundamental supply side issues. These may for example include efforts to improve the supply of skills to businesses, transport and communications.

¹⁵¹ The limited number of UK producers means that for confidentiality reasons Prodcom does not record the number or value of parachutes produced in Britain. However imports, at £3.5 million, are less than exports, at £11m, demonstrating that this is the sort of product that is produced primarily within high wage economies. I am grateful to staff at one UK parachute manufacturer for explaining the industry to me.

¹⁵² Leunig and Swaffield (2007), p. 46.

4.9 Bibliography

Philip Aghion, Nicholas Bloom, Richard Blundell, Rachel Griffith and Peter Howitt (2005) "Competition and innovation: an inverted U relationship", *Quarterly Journal of Economics*

American Fiber Manufacturers Association, online statistics:
<http://www.fibersource.com/f-info/fiber%20production.htm>

John Baffes and Gaston Gohou (2005) "The Co-movement between Cotton and Polyester Prices", *World Bank Policy Research Working Paper* 3534: http://www-wds.worldbank.org/servlet/WDSContentServer/WDSP/IB/2005/03/09/000012009_20050309101052/Rendered/PDF/wps3534.pdf

Nicholas Bloom and John Van Reenen (2007) "Measuring and explaining management practices across firms and countries" *Quarterly Journal of Economics*, November 2007

Stephen N Broadberry and Nicholas Crafts (2001), "Competition and Innovation in 1950's Britain", *Business History*, vol 43.

Alfred D Chandler with the assistance of Takashi Hikino (1990), *Scale and scope: the dynamics of industrial capitalism* Cambridge, Massachusetts: Belknap Press of Harvard University Press.

David Clayton (2010), "Buy British: the Collective Marketing of Cotton Textiles, 1956-62", *Textile History*, forthcoming (page references refer to mimeo version)

D.C. Coleman (1980), *Courtaulds: an economic and social history*, Oxford: Clarendon Press.

Cotton Inc (2009), *U.S. Cotton Market Monthly Economic Letter – September 14, 2009*: <http://www.cottoninc.com/MarketInformation/MonthlyEconomicLetter/#3>.

N.F.R. Crafts (2010), "Competition in post-war Britain" *Explorations in Economic History*.

B Curry and K D George (1983), "Industrial Concentration: A Survey", *Journal of Industrial Economics* vol 31 (3), pp. 203-55.

D.C. Hague (1957), *The Economics of Man-Made Fibres*, London, G. Duckworth, 1957.

Les Hannah (1983), *The rise of the corporate economy*, second edition, London: Methuen.

Les Hannah and John Kay, (1977) *Concentration in modern industry: theory, measurement and the U.K. experience*, London: Macmillan.

S. J. Hyde, (1972) "New product promotion and exploitation: polyester cotton sheets" in *Textiles in the economy of a developed country: papers presented at the fifth Shirley international seminar, Manchester: Shirley Institute*.

Donald Keesing and Martin Wolf (1980), *Textile Quotas against Developing Countries* London: Trade Policy Research Centre

- Carol Kennedy (1986), *ICI: the company that changed our lives*, London, Hutchinson.
- Au Kin-Fan and Wong Man-chong (2006), "Polyester market to enjoy good prospect" *ATA Journal for Asia Textile and Apparel*:
http://textile.2456.com/eng/epub/n_details.asp?Epubiid=4&id=418
- William Lazonick (1990), *Competitive advantage on the shop floor* Cambridge, Mass: Harvard University Press.
- Timothy Leunig, 2003. "A British industrial success: productivity in the Lancashire and New England cotton spinning industries a century ago," *Economic History Review*, vol. 56(1), pages 90-117
- Tim Leunig and James Swaffield (2007), *Cities unlimited: making urban regeneration work* London: Policy Exchange.
- Andrew Marrison, Stephen Broadberry and Tim Leunig "Selling English cotton into the world market: implications for the rationalisation debate, 1900-1939", in John F Wilson, (ed) *King cotton: a tribute to Douglas F Farnie* Carnegie, Lancaster, 2009.
- Caroline Miles "Protection of the British textile industry" in W. M. Corden and Gerhard Fels *public assistance to industry: protection and subsidies in Britain and Germany*, Macmillan, 1976.
- Stephen J Nickell (1996), "Competition and Corporate Performance," *Journal of Political Economy*, vol. 104 (4)
- Sir Geoffrey Owen (1999), *From empire to Europe: the decline and revival of British industry since the Second World War*, London: Harper Collins.
- Mike Parsons and Mary Rose (2003), *Invisible on Everest: innovation and the gear makers*, Philadelphia: Old City Publishing.
- Mike Parsons and Mary Rose (2005) 'The neglected legacy of Lancashire cotton: industrial clusters and the UK outdoor trade 1960-1990', *Enterprise and Society*, vol 6 (4), pp. 682-709.
- C.F. Pratten (1971), *Economies of scale in manufacturing industry*, Cambridge: Cambridge University Press.
- Peter Scott (2004), "British regional development and policy since 1945" in Roderick Floud and Paul Johnson, *The Cambridge economic history of modern Britain: structural change and growth, 1939-2000*, Cambridge: Cambridge University Press.
- John Singleton (1991), *Lancashire on the scrapheap: the cotton industry, 1945-1970*, Pasold studies in textile history; 8, Oxford: Oxford University Press.
- Textile Council (1969), *Cotton and allied textiles: a report on present performance and future prospects*, volume 1, Manchester: Textile Council.

5. The Pharmaceutical Industry in the UK

Chapter author: Nicholas Owen

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5.1 Introduction

In choosing sectors whose history, evolution and growth could provide useful policy lessons for Government, the pharmaceutical industry almost selects itself. It is indisputably one of the UK's most successful sectors. It is also influenced in several different ways by Government: in its role as a major customer; as a regulator of medicines; as a funder of R&D; and as a provider of skills. The sector's exceptional dependence on R&D makes it a particularly interesting one at a time when Governments increasingly perceive R&D as a basis for competitive advantage and as an engine of economic growth. Another topical aspect of the sector is that it is global: its products transcend national boundaries and although its leading companies "belong" where their headquarters are located, and carry out most of their administration and marketing from there, they are increasingly locating their manufacturing operations, R&D and clinical trials wherever the most competitive locations can be found for them – not necessarily, or indeed, typically in the same country.

5.2 The Industry's Structure and Development

THE INDUSTRY IN CONTEXT

The UK Pharmaceutical industry is a major global player. In 2006 it was the fourth largest in the world in terms of value added, behind those of the US, Japan and Germany. It then accounted for 0.71 per cent of UK GDP – rather more than in other large economies, and less than three smaller European economies – Belgium, Sweden and Denmark.

Table 5.1: Value Added by the Pharmaceutical industry in selected countries, 2006

Value added by the pharmaceutical industry in selected countries, 2006		
	\$US million	As a per cent GDP
United States	91,500	0.69%
Japan	27,200	0.62%
Germany	19,100	0.66%
United Kingdom	17,200	0.71%
France	12,400	0.55%
Italy	8,600	0.46%
Sweden	5,800	1.47%
Spain	5,100	0.41%
Belgium	4,900	1.22%
Denmark	2,900	1.06%
Netherlands	2,300	0.34%
Austria	1,800	0.56%
Norway	800	0.24%
Finland	500	0.24%
Portugal	400	0.20%
Greece	400	0.15%

Sources: Value added, OECD STAN Structural database; Annual average exchange rates: Federal Reserve Statistical Release, 3 January 2007; GDP: IMF World Economic Outlook Database.

The UK's two largest pharmaceutical companies are among the most successful in the world. In terms of global sales, GlaxoSmithKline and AstraZeneca, ranked 2nd and 5th respectively in 2007.

Table 5.2: Top ten global pharmaceutical companies, 2007

Top ten global pharmaceutical companies, 2007				
Rank	Company	Country	Sales £m	Market share (per cent)
1	Pfizer	USA	22,300	6.7
2	GlaxoSmithKline	UK	18,800	5.6
3	Novartis	Switzerland	17,200	5.1
4	Sanofi Aventis	France	16,800	5.0
5	AstraZeneca	UK	15,000	4.5
6	Johnson & Johnson	USA	14,500	4.3
7	Roche	Switzerland	13,800	4.1
8	Merck & Co	USA	13,600	4.1
9	Abbott	USA	9,600	2.9
10	Lilly	USA	8,300	2.5
The Top 10			149,900	44.9

Source: IMS, cited by the Association of the British Pharmaceutical Industry (ABPI).

The UK industry has excelled particularly in originating important medicines. A comparison of the national origins of the world's 75 leading medicines (by global sales)¹⁵³ revealed that in 2007, about 55 per cent of them originated in the US, 19 per cent in the UK, 10 per cent in Switzerland, 5 per cent in Japan, 5 per cent in France, and 2 per cent in Germany. Of the 50 top selling medicines in the UK in 2007, GSK was responsible for five, AstraZeneca for 13.

The pharmaceutical industry is one of the most global industries. One indicator of this is that the market shares of the industry's leading companies are not largely influenced by the physical location of that company. For example, in the UK market, companies' market shares are quite similar to their shares of the global market. In 2007, the global leader, Pfizer, was also the market leader in the UK; GlaxoSmithKline and AstraZeneca were respectively in the 2nd and 4th positions in the UK – very similar to their global rankings.

Table 5.3: Leading pharmaceutical corporations' UK market share, 2007

Leading pharmaceutical corporations' UK market share, 2007				
	Company	Country	Sales £m	Market share (per cent)
1	Pfizer	USA	1,090	9.3
2	GlaxoSmithKline	UK	1,060	9.0
3	Sanofi-Aventis	France	780	6.7
4	AstraZeneca	UK	670	5.7
5	Novartis	Switzerland	460	3.9
6	Roche	Switzerland	440	3.7
7	Wyeth ¹⁵⁴	USA	390	3.3
8	Merck & Co	USA	350	3.0
9	Lilly	USA	350	2.9
10	Boehringer Ingelheim	Germany	270	2.3
11	Johnson & Johnson	USA	260	2.2
12	Schering Plough	USA	250	2.1
13	Novo Nordisk	USA	220	1.9
14	Bayer Schering	Germany	200	1.7
15	Abbott	USA	170	1.4
16	Teva	Israel	140	1.2
17	Bristol-Myers Squibb	USA	110	1.0
18	Mundi Int.	USA	110	1.0
19	Gilead Sciences	USA	110	0.9
20	Servier	France	100	0.9

Source: *The Association of the British Pharmaceutical Industry (ABPI), based on IMS Dataview.*

¹⁵³ Pharmaceutical Industry Competitive Task Force (PICTF), *Competitiveness and Performance Indicators 2009* (unpublished). National origin: the home-base of the company responsible for the first synthesis, or where not known, the country of patent priority for a New Molecular Entity.

¹⁵⁴ Wyeth has since merged with Pfizer.

THE ESTABLISHMENT OF THE PHARMACEUTICAL INDUSTRY¹⁵⁵

Historians of the industry identify three major stages. The first of these, 1850-1945, involved modest levels of research. Prior to this, there were no standardised medicines for treating specific conditions; local apothecaries formulated their own prescriptions and some began commercial production. The modern industry originated from German developments in synthetic organic chemistry, using the same techniques as had been developed for synthetic dyestuffs, and drawing on the strength of the organic chemistry departments of German universities. Companies such as Ciba, Sandoz, Bayer and Hoechst began to manufacture medicines (e.g. Bayer's Aspirin in 1899, Hoechst's Salvarsan in 1909). Such companies emerged also in the USA and UK, but as specialised producers, rather than part of chemical companies – Wyeth, Eli Lilly, Pfizer, Warner-Lambert and Burroughs-Wellcome.

In the second stage, 1945-1990, the industry adopted its present R&D-intensive shape. Its leaders established in-house R&D departments, and Governments became heavily involved in health-related research. The catalyst was the vast and pressing need for antibiotics in World War II. Alexander Fleming had discovered penicillin in 1928, but in the pre-war period it was produced only in small quantities, for experimental purposes. The industrial solution for making penicillin – and later other broad spectrum antibiotics – was developed by the Americans, at the request of the UK Government. The US Government organised a massive research and production effort which led to the large-scale production of penicillin, based on a fermentation process developed by Pfizer.

In its early years, R&D focused on the random screening of natural and chemically derived products. From the 1970s, it turned to “drug development by design”, drawing on developments in molecular chemistry, pharmacology and enzymology. One of the most significant of these developments was the invention of the first clinically useful beta blocker (Propanolol) by Sir James Black in the late 1950s, working for ICI, which revolutionised the management of angina.

The third stage began in about 1990, with the introduction of genetic engineering, brought about by the cell and gene discoveries of the 1970s. In 1973, two American scientists, Herbert Boyer and Stanley Cohen, discovered recombinant DNA, whereby genes could be transferred from one organism to another in order to produce new substances with different properties. Together with a related technique for fusing and multiplying cells, which was discovered two years later, recombinant DNA opened up the possibility of genetically engineering micro-organisms, such as anti-bodies, that would have therapeutic value.

This technology developed along a quite different trajectory from that followed in the previous stage. It occurred in new, rather than established companies, founded by scientist-entrepreneurs, who retained close links with university science. The question then was whether these new entities would develop into fully integrated pharmaceutical companies, possibly displacing the incumbents, or whether they would establish a more symbiotic relationship with them.

¹⁵⁵ The historical sections of this paper draw principally from the chapter, “The Winning Formula”, in Geoffrey Owen's history of British manufacturing in the post-War period (Owen (1999)), and from Henderson, et al (1999).

In practice this “Molecular Revolution” has not swept away established players, based on earlier chemistry-based technologies. The world's leading biotechnology company, Amgen, did become an integrated manufacturer but most biotechnology firms became R&D specialists, supplying the integrated companies, either as independents or as subsidiaries. One interpretation of this is that the strategic assets of the established pharmaceutical companies lay not just in their research, as might be supposed from the prominence of research in the pharmaceutical story, but in their skills in manufacturing, development, clinical trials, securing approvals, and marketing.

Thus we can see a rich mix of formative influences in this history: creative individuals, science-based organic chemistry, the strategic significance of medicines in wartime and the impetus that this imparted to organised R&D laboratories, large-scale production methods and Government support for medical research.

THE EVOLUTION OF THE STRUCTURE OF THE INDUSTRY

The way that the structure of the UK pharmaceutical industry has evolved is largely the story of its major companies. Burroughs-Wellcome & Company was founded in London in 1880 by American pharmacists Henry Wellcome and Silas Burroughs. Glaxo was founded in New Zealand in 1904, to process local milk into a baby food by the same name: Glaxo became Glaxo Laboratories, opened new units in London in 1935, and acquired Joseph Nathan and Allen & Hanburys in 1947 and 1958 respectively. After acquiring Meyer Laboratories in 1978, Glaxo started to play an important role in the US market. Burroughs Wellcome and Glaxo merged in 1995 to form GlaxoWellcome.

In 1843, Thomas Beecham launched a laxative, Beecham's Pills. By the 1960s, the Beecham Group was extensively involved in pharmaceuticals. In 1830, John K. Smith opened its first pharmacy in Philadelphia. In 1865 Mahlon Kline joined the business which, 10 years later, became Smith, Kline & Co. In 1891, it merged with French, Richard and Company, to become Smith Kline & French Laboratories. The Company merged with Beckman Inc. in 1982 to become SmithKline Beckman.

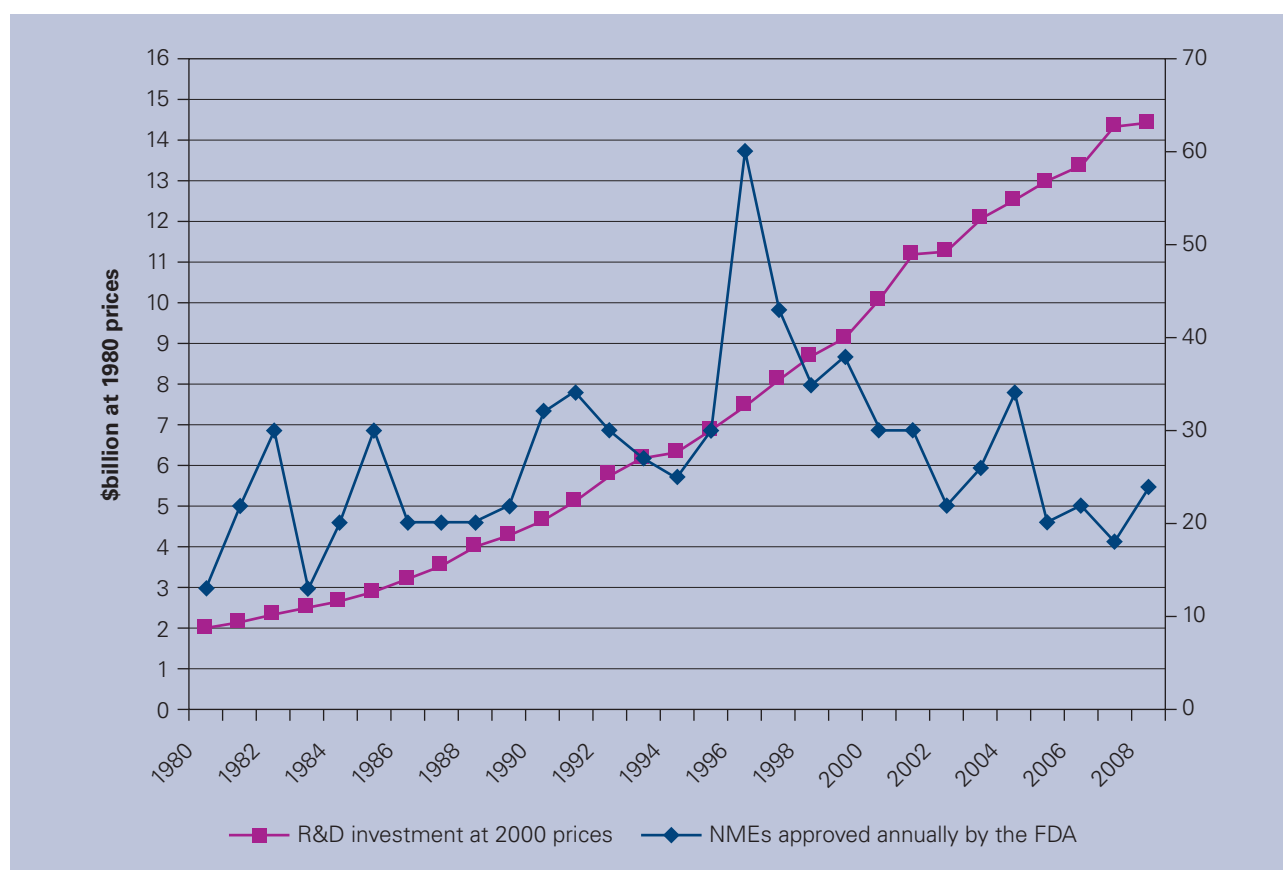
In 1988, SmithKline Beckman bought its biggest competitor, International Clinical Laboratories, and in 1989 merged with Beecham to form SmithKline Beecham plc, and redomiciled itself to the UK. This was the first major merger in the pharmaceutical industry in recent times. In 2000, Glaxo Wellcome and SmithKline Beecham merged to form GlaxoSmithKline. There is a certain irony in the way the Glaxo story has played out. Beecham sought to acquire Glaxo in 1971, but was turned down by the Monopolies Commission, which, like Glaxo at that time, was unimpressed by Beecham's argument that the merger was necessary in order to exploit economies of scale in R&D. The two companies were eventually brought under common ownership, in 2000.

AstraZeneca also had diverse origins: Zeneca's date from 1912, when Atlas Chemical Industries was founded as a result of a demerger from DuPont, in Wilmington, USA. Atlas Chemical Industries was acquired by ICI in 1972. ICI's pharmaceutical Division

engaged Sir James Black in 1958 and then advanced on the strength of his invention of the beta blocker (Propanolol). It was spun off in 1992 as the Zeneca Group plc. Astra AB was founded in 1913 by 400 doctors and apothecaries in Södertälje in Sweden. In 1999, Astra AB and Zeneca Group plc merged to form AstraZeneca plc.

The principal motivation for consolidation in the pharmaceutical industry may be that the productivity of its R&D is declining. Data relating to the productivity of R&D in the pharmaceutical sector is incomplete and not available for the whole UK pharmaceutical sector. However, data available for the US shows R&D expenditure increased in real terms between 1980 and 2008 by an average of seven per cent a year. Meanwhile, the number of new molecular entities (NMEs) that are approved each year by the US Food and Drug Administration has shown no significant trend over this period as a whole, and has declined over the last decade.

Figure 5.1: The productivity of US pharmaceutical R&D



Source: R&D data: Pharmaceutical Research and Manufacturers of America (PhRMA), *Pharmaceutical Industry Profile 2009*, page 50. This includes R&D performed outside the US by US companies. R&D expenditures were adjusted for inflation using the biomedical research and development price index published by the Bureau of Economic Analysis. NME approvals: 1980-1992, industry presentation; 1993-2008: presentation by John K Jenkins, FDA Center for Drug Evaluation & Research, December 3, 2009.

As the pharmaceutical industry is one of the most global industries, it could be argued that the picture observed in the US market could also be observed in the UK and global market.

On the other hand, GlaxoSmithKline recently disclosed a measure of their productivity in R&D, saying the estimated return on investment from its late-stage pipeline is around 11 per cent which "we believe is an improvement on the industry average over the last ten years"¹⁵⁶. However, more comprehensive and recent data for the UK is unavailable.

In the US, the out-of-pocket costs of discovering a new molecular entity in 2000 was \$400 million (US\$ 800 million when capitalised to the point of marketing approval), and had been rising in real terms by over seven per cent a year, according to DiMasi, Hansen and Grabowski (2003).¹⁵⁷ According to the same authors (2007), by 2006 the cost had risen to \$1,300 million.¹⁵⁸ This is partly because the "low-hanging fruit" has already been picked and partly because, in this author's opinion, regulatory hurdles are becoming more demanding. Is greater scale part of the solution? Some academic studies have suggested that the pharmaceutical companies experience decreasing returns to scale in R&D. For example, the study by Graves and Langowitz (1993) of 16 pharmaceutical companies over a 19-year period concluded that there are decreasing returns to scale in R&D, remarking that "the wave of mergers in the industry may yield less innovative productivity than managers expect."¹⁵⁹ But the horizontal mergers appear to be successful, but not because the companies are constructing ever-larger R&D establishments. Quite the opposite, they are creating smaller units, mimicking small biotech companies, as GSK has done post-merger, with its Centres of Excellence for Drug Discovery.

The mergers could be succeeding for three reasons.

- Large companies are more productive in pharmaceutical R&D, because the economies of scope in diversified R&D portfolios enable spillovers between therapeutic areas to be captured internally, as suggested by Henderson and Cockburn (1996).
- Acquisitions have enabled larger companies to fill R&D pipelines where they are running low, and to reposition themselves in the fastest growing therapeutic areas.
- They exploit the economies of scale in marketing; larger companies require proportionately fewer salesmen.

A more general question about the evolution of the UK industry is why has the UK succeeded in this *particular* R&D-intensive industry, noting that German industries have been much more successful than their British counterparts in established

156 GSK press release: <http://www.gsk.com/investors/reports/q42009/q42009.pdf>.

157 Joseph A. DiMasi, Ronald W. Hansen and Henry G. Grabowski (2003), The price of innovation: new estimates of drug development costs, *Journal of Health Economics*, Vol. 22, Issue 2, pp. 151-185. Out-of-pocket costs were capitalised to the point of marketing approval at a real discount rate of 11 per cent.

158 J. A. DiMasi and H. G. Grabowski, "The Cost of Biopharmaceutical R&D: Is Biotech Different?" *Managerial and Decision Economics* 28 (2007): 469-479.

159 Samuel B. Graves and Nan S. Langowitz (1993), Innovative productivity and returns to scale in the pharmaceutical industry, *Strategic Management Journal*, Volume 14, Issue 8, pp. 593 - 605.

science-based industries such as industrial chemicals, vehicles, electrical engineering? Geoffrey Owen noted, “a generally supportive relationship with Government during the 1960s and 1970s” and a “stable but demanding regulatory framework”.¹⁶⁰

Another part of the answer is the adroit way in which UK pharmaceutical firms broke free from non-life-science related chemical industries and, through a mix of mergers and internal expansion programs, substantially increased their ability to respond effectively to new research opportunities. Two personalities played important roles here. Alan Wilson, Chairman at Glaxo from 1963, decided to switch from a license-based to a more research-based approach; the Allen & Hanburys laboratory at Ware, under the leadership of David Jack “was largely responsible for lifting Glaxo into the front rank of the world pharmaceutical industry”.¹⁶¹

A different type of explanation was advanced by Caspar and Matraves (2003) who attributed the industry’s superior adaptability to British corporate governance. This exerts pressures on managers to perform, but it also allows them freedom to restructure their companies, develop alliances and acquire biotechnology firms; German companies are ponderous in comparison. It is not clear how the UK’s corporate governance could account, for example, for Glaxo’s success with Zantac, or ICI’s with heart drugs; or why, if the UK’s corporate governance favours this industry, did the industry not perform better in biotechnology (see below).

MEDICAL BIOTECHNOLOGY IN THE UK

Medical biotechnology is an important sector of the Life Sciences industry. Global sales of medical biotechnology products¹⁶² are estimated at between £45–48 billion with growth rates of more than 20 per cent per annum over the period 2002 to 2007. This is more than double the rate for the pharmaceutical market.¹⁶³ Biotechnology offers new opportunities in the manufacture and development of Life Sciences products such as biopharmaceuticals. These are high value products which generally have a better chance of being successful in the clinical stages of development than small-molecule pharmaceuticals. Although it is possible to distinguish between the pharmaceutical, medical biotechnology and medical technology sectors in broad terms, in practice they are increasingly converging into a single sector.

During the 1980s, universities, venture capitalists and the Government sought to mimic the institutions in the US that had created numerous biotechnology start-ups. While the UK has emerged as the European leader in biotechnology, it has lagged far behind that in the US.

Biotechnology’s development in the UK has, on the whole, been a story of high hopes, based on outstanding science, followed by some financial disasters. In 1996 the Roslin Institute near Edinburgh produced Dolly, the world’s first cloned mammal. In 2003, PPL Therapeutics, the company that was spun off to exploit the technology,

¹⁶⁰ Geoffrey Owen, op. cit. page 374.

¹⁶¹ Geoffrey Owen, op. cit. page 375.

¹⁶² Excluding small molecules.

¹⁶³ Source: IMS Health.

was shut down and acquired by US investors for a knock-down price. The biotechnology industry's largest company in 2007, Protherics (acquired in 2008 by BTG for £218 million), is no more than a small and medium-sized enterprise (SME), ranked as the 18th largest biotechnology in the world, with sales of just \$47 million.¹⁶⁴ In contrast, Amgen, the world's leading biotech company, is the 11th largest pharmaceutical company in the world, with 2007 sales of about \$15,000 million.

Why, then, did the UK biotechnology industry develop so much later than the US industry, and continue to lag behind? One answer is the close collaboration in the US between state and federal research agencies, universities and venture capitalists. The UK did not have many venture capitalists in the 1970s. There was also a weaker tradition of academic entrepreneurship in the UK. Opportunities were missed to patent the discovery of monoclonal antibodies arising from the Medical Research Council Laboratory of Molecular Biology at Cambridge. State intervention (the establishment of Celltech in 1980, funded by the National Enterprise Board, and with the right of first refusal on biotechnology discoveries emerging from the research by the MRC) was necessary to get the UK biotechnology industry off the ground, again in contrast to the USA, which by this stage had nearly 100 dedicated firms. This intervention triggered the formation of many others.

The first of these to be publicly floated, in 1992, was British Biotechnology, founded by two former G D Searle managers, using their redundancy payments, following the disbanding of Searle's R&D department after its acquisition by Monsanto. Despite having no compounds on or even to near the market, by May 1996 British Biotech's share price had risen to over £30, taking it close to the FTSE 100. Investigations into the company found that it had willfully misled the public about the progress of its principal product. In 2003, British Biotech, merged with its rival, Vernalis, and abandoned its historic name and home in Oxford. The star of the sector had risen and fallen.

In the last two years there has been a 30 per cent decrease in the number of publicly listed biotechnology and pharmaceutical companies on the London Stock Exchange¹⁶⁵ and today there are around 90 listed biotechs. Furthermore, some hold the view that "fewer than a dozen of these have a solid business with revenue streams or deal with large firms".¹⁶⁶ Many of them have just one or two products in development.

However, recently the biotechnology sector has been evolving and converging with the pharmaceutical sector. This has been largely driven by the entry of major pharmaceutical companies into researching, manufacturing and marketing of biopharmaceuticals, which offer a better chance of being successful in the clinical stages of development than small-molecule pharmaceuticals. As a result, large pharmaceutical companies are obtaining a greater proportion of their pipeline from biotechnology companies via development deals, licensing and company acquisitions.

¹⁶⁴ Celltech would probably have been higher placed, had it still been an independent company. In 2004, it accepted a cash offer from UCB, a Belgian pharmaceutical and chemical company, which valued it at about £1.5 billion, and is now known as UCB Celltech.

¹⁶⁵ Pharmaceutical and biotechnology companies listed on the London Stock Exchange, Sept 2007 – Aug 2009.

¹⁶⁶ Moneyweek, 2 October 2009.

5.3 The impact of Government on the industry

There are many factors that have shaped the evolution and growth of the sector. This section focuses on the aspects where Government plays a significant role.

Recalling that the industry is global, increasingly footloose, and often carries out its R&D in locations that are remote from its other operations, a question to bear in mind here is whether, and via which mechanisms, Government policies that influence the domestic business environment and *market* for medicines (prices, approvals and expenditure) influence the location of pharmaceutical R&D.

A study by NERA (2007) examined whether market conditions (pricing environment and rate of adoption of new technology) affect the decision of where to locate R&D. The report “did not find credible economic mechanisms to suggest that product market characteristics were of over-riding importance when making investment decisions. Firms should locate research and manufacturing in the best and most cost-efficient locations, then market their products globally.” However, the report also found that “firms often have a number of alternative locations for investment assets that are broadly equal in other dimensions, and in these situations market conditions can be an influence on the ultimate choice”.

The paper also concluded that a range of factors influence the decision on where to locate R&D. These included: low tax, low bureaucracy, flexible labour market, political stability and the quality of the science base. Clearly the Government has a major influencing role in these areas.

GOVERNMENT’S INFLUENCE AS A PURCHASER

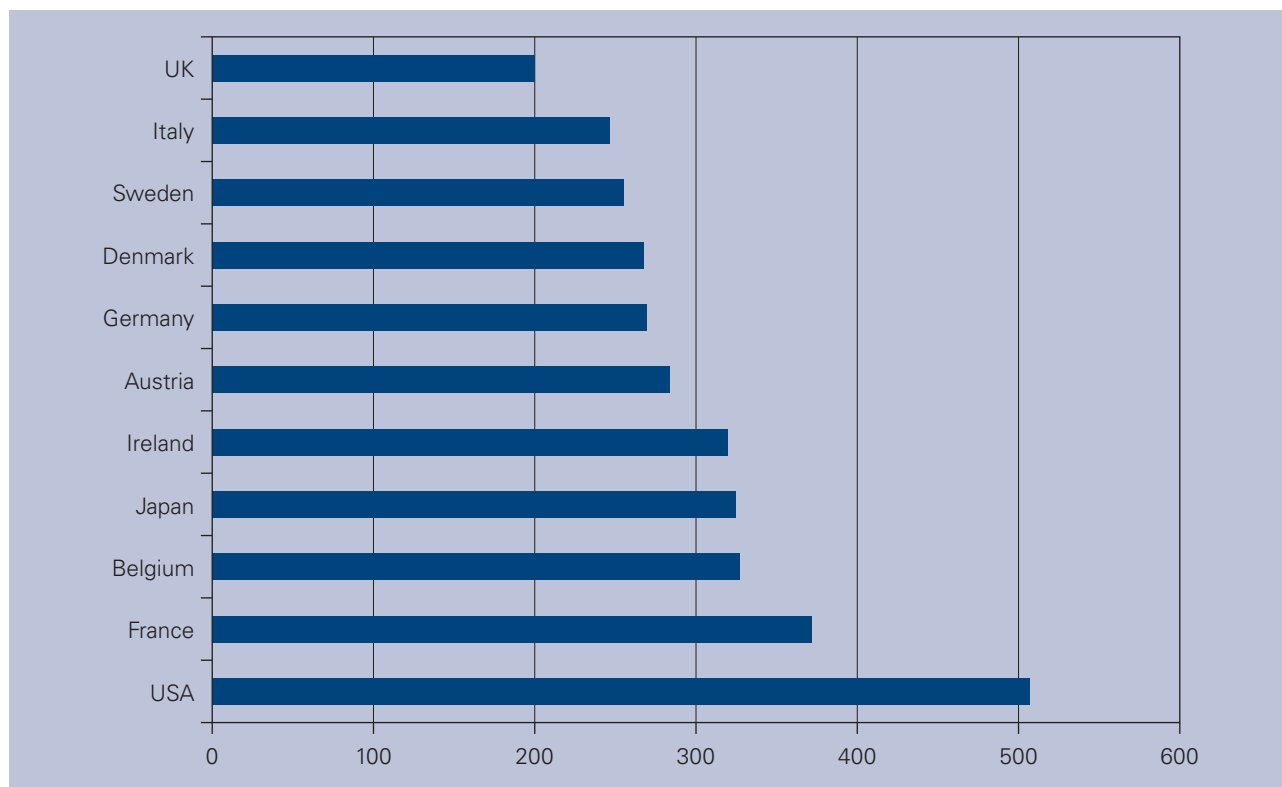
This topic was given added prominence by the work of Michael Porter (1990), who argued that an industry’s competitive advantage can be enhanced by features of its domestic demand: high volume, a number of independent buyers, early adopting, and the presence of sophisticated and demanding buyers. However these arguments may not hold for the pharmaceutical industry, where there is no significant requirement for geographically associating key value-adding activities such as R&D with the final product markets.

Through the NHS, the Government is a major customer for pharmaceutical products in the UK and the demands of the NHS will naturally have an impact on the domestic pharmaceutical market. However, as previously noted, the pharmaceutical industry is one of the most global industries and the UK represents only around 4 per cent of the world market for pharmaceuticals so the effect on global R&D is likely to be small. Nevertheless, as a major customer, the NHS is in a position to affect market conditions and competition through its purchasing behaviour.

The UK is not an exceptional spender on medicines (Figure 5.2).¹⁶⁷ Nor is the UK rated particularly favourably in terms of its up-take of new medicines (see Figure 5.3 and discussion in later section: The Government’s approach to the use of medicines in the NHS).

¹⁶⁷ This may reflect the quality of UK medical practice.

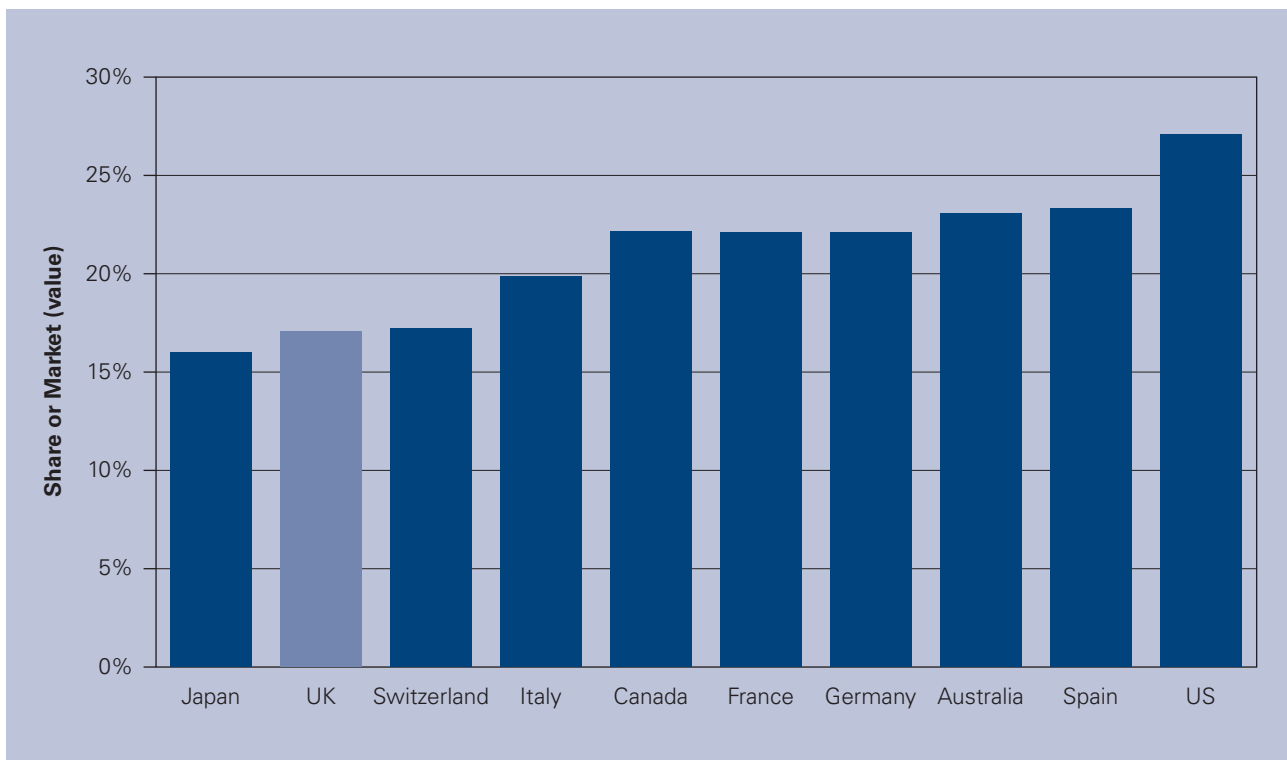
Figure 5.2: Annual expenditure on medicines per person, 2008 (£)



Source: ABPI, based on IMS World Review, United Nations, World Population Prospects, Office for National Statistics. The comparisons include prescription and hospital medicines.

Generic prescribing rates are reported to be much higher in the UK – over 80 per cent in many practices – than in many other countries. The Department of Health's public service agreement target to make increasing use of generic substitutes for out-of-patent medicines ensures that patients and taxpayers get the maximum benefit of price-competition following patent expiry. However, high use of generics reduces returns on investments for research-based pharmaceutical companies – although this, on its own, is not expected to significantly affect the incentives to invest in the UK, and the impact on total returns to investment cannot be large, as the UK is a small part of the global market.

Figure 5.3: Percentage of National Pharmaceutical Market in 2004 Accounted for by Products launched within the last 5 years



Source: PICTF (2005) Indicator 19.

A singular feature of the market for medicines is that, under publically funded healthcare systems, the customer does not have to pay the full cost of medicines, or indeed, anything at all. Because doctors' central concern is medical efficacy, not cost, the demand for medicines is highly insensitive to price. In the absence of some form of regulation, this would result in excessive costs to the taxpayer.¹⁶⁸ A challenge for Governments is to contain the costs of medicines, on the one hand, and to encourage the discovery and supply of new medicines on the other. Governments have made very different choices in this matter: the US Government does not regulate the prices of medicines at all. Of those Governments that do so, some recognise and allow for the cost of the R&D required to develop new medicines; others do not, and are content to free-ride on the efforts of those countries which foster an R&D-based pharmaceutical industry.

The UK's solution to this problem, for over fifty years, is the Pharmaceutical Price Regulation Scheme (PPRS). Its predecessor, the Voluntary Price Regulation Scheme (VPRS) – was introduced in 1957. The scheme has been renegotiated every five years or so, ever since, with agreements in 1961, 1964, 1969, 1972, 1978, 1986, 1993, 1999, 2005 and 2008 (an interim agreement) and 2009. The scheme has sought to strike a balance to ensure that the interests of patients, the NHS, the industry and the taxpayer are promoted for each other's mutual benefit.¹⁶⁹

¹⁶⁸ As an OFT report (OFT, 2007, paragraph 2.117) expressed it, "a strong justification for some form of UK-wide pricing scheme is the need to ensure money spent on prescription drugs represents value for money. While there is variation at a local level, prescribers in primary care generally demonstrate low price sensitivity. Under current arrangements, some products with very close clinical effects but wide disparities in price achieve high prescribing volumes, raising a major question as to whether value for money is being secured".

¹⁶⁹ The objectives of the 2009 Pharmaceutical Price Regulation Scheme are to deliver value for money; encourage innovation; promote access and uptake for new medicines; and provide stability, sustainability and predictability.

The PPRS is a voluntary scheme regulating profits and prices. Of particular importance to the industry is that it allows companies the freedom to set prices of new products. Of comparator countries, only the US, Switzerland and Germany allow this (PICTF indicators 2005, Indicator 21). The PPRS is a five-year agreement that sets out a schedule of price changes over its life and imposes a ceiling on scheme members' rates of return on capital earned on the branded medicines they supply to the NHS. For example, the 2009 Scheme¹⁷⁰ aimed to delivering a price cut of 5 per cent over the lifetime of the scheme, beginning with a 3.9 per cent price cut in January 2009. It allows individual scheme members to earn a return on capital ("allowable ROC") of 21 per cent a year from home sales of NHS medicines, based on the historical value of average capital employed. Pharmaceutical suppliers that do not have major capital investments in the UK can work on a return on sale (ROS) basis. The 2009 Scheme also allows a contribution to the worldwide cost of R&D.¹⁷¹

Since the fourth Voluntary Price Regulation Scheme (VPRS),¹⁷² one of the scheme's explicit objectives has been "to promote a strong and profitable pharmaceutical industry" that is both capable of, and willing to, invest in sustained research and development to encourage the future availability of new and improved medicines for the benefit of patients and the industry.

So how well has the PPRS been judged to have balanced cost containment with encouraging R&D over the last fifty years? Medicines' share of the costs of the NHS has remained broadly stable, at around 12 per cent, due to the PPRS and also to the increasing use of generics, and demand management. The UK industry has invested prodigiously in R&D (see below). These indicators suggest that the PPRS has succeeded in its aims.

The PPRS has been applauded by academics. Thomas (1994) viewed it as an industrial policy, comparing it favourably with the arrangements in France: "Thus, industrial policy laid the ground work for the spectacular rise to global success of UK pharmaceutical firms and the corresponding failure of French firms." Taylor (2003) concluded that "Britain has arguably been successful in containing domestic medicines spending while permitting research based pharmaceutical companies to prosper, and contribute a £2 billion export surplus".

Academic support for its pro-R&D character was also forthcoming from across the Atlantic. Olson (1995) concluded that the Scheme's encouragement of the development of new medicines had resulted in *lower* overall expenditure by the NHS. More effective medicines replaced less effective ones. Moreover, the UK received positive spillovers, in the form of lower NHS costs, from R&D conducted in the UK by US firms.

Bloom and Van Reenen (1998) were more guarded, noting that "whilst the PPRS may have helped to foster the conditions necessary to create a successful UK

170 "The Pharmaceutical Price Regulation Scheme, 2009", published jointly by The Association of the British Pharmaceutical Industry and the Department of Health, December 2008.

171 The maximum R&D allowance is 22 per cent of NHS home sales for assessing price increases (level 1) and 30 per cent of NHS home sales for assessing Annual Financial Returns (level 2) (Paragraph 8.29).

172 This was the predecessor to the PPRS, the fourth agreement of which was set in 1969.

pharmaceutical industry, there are clearly other important factors behind this success, such as the strong university tradition of biomedical research, the role of the NHS and the early introduction of efficacy regulation.”

To conclude thus far on this topic, although the UK is a small part of the overall world market, the NHS is a major customer of pharmaceutical products and is in a position to affect domestic market conditions and competition through its purchasing behaviour – although it is unlikely to have significant impact on total returns to R&D, which are determined in the global market. The UK spends a smaller amount of national income, and less per person, on medicines than many other countries and uptake of new medicines is also lower. High use of generics ensures patients and the taxpayer receives the maximum benefit of price competition. The PPRS succeeds in its objectives, containing costs while encouraging R&D. It has also received a chorus of approval from academics.

SUPPORTING THE DEVELOPMENT OF SCIENTIFIC KNOWLEDGE

Government has a key role as funder of the public education system, and of university and medical teaching and research. This case study looks briefly at two aspects of this vast subject – British science and British medicine – and then describes the roles of some of the UK’s supporting scientific institutions.

The strength of British research in subjects relevant to the life sciences is indicated by the fact that British (or British-based) scientists have won significantly more Nobel Prizes in these research fields since 1945 than any other European country.

Table 5.4: Nobel Prize winners in Chemistry, and Physiology or Medicine, 1945-2009, selected countries

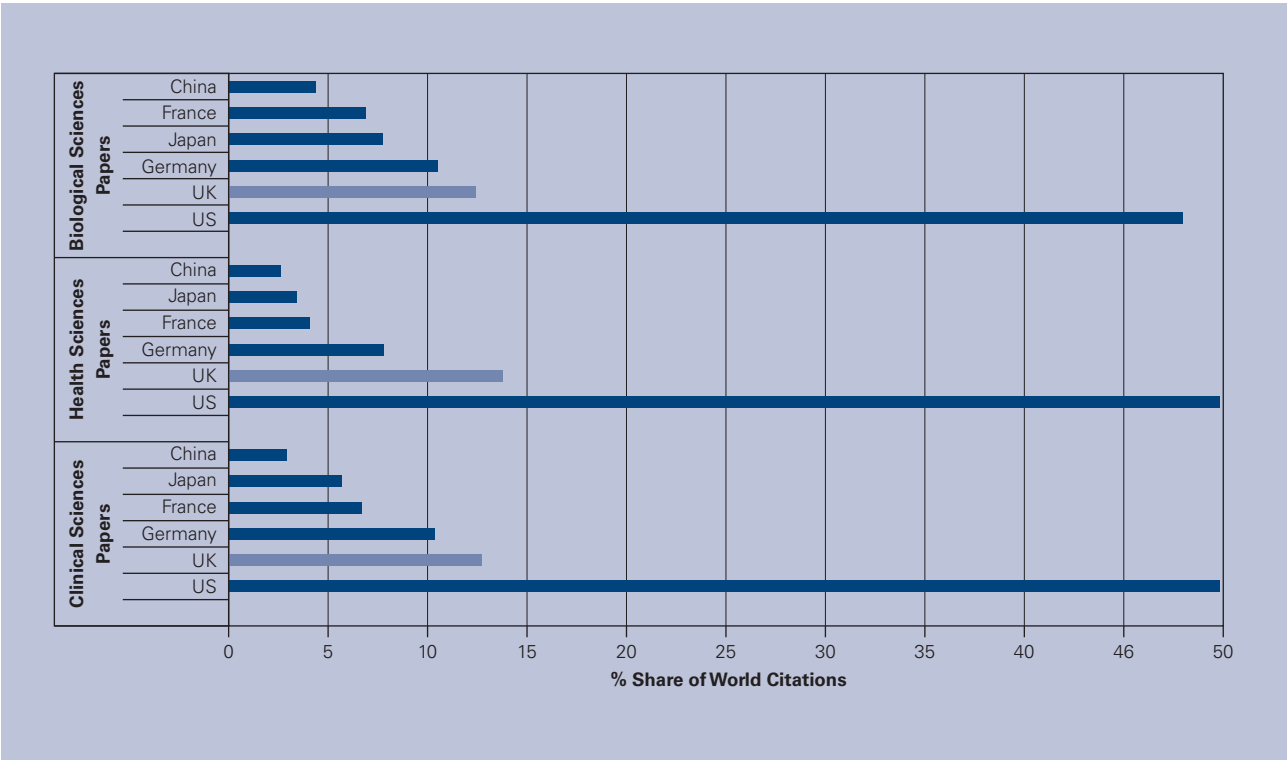
	Physiology or Medicine	Chemistry	Total
USA	73	72	145
UK	26	22	48
Germany	14	12	26
France	8	2	10
Italy	5	1	6
Switzerland	8	3	11

Data Source: Wikipedia.

Bibliometric evidence indicates that British science is not only strong but it is particularly so in the disciplines relevant to the life sciences. Figure 5.4 shows that the UK performs well in terms of the share of world citations in biological, health and clinical sciences.

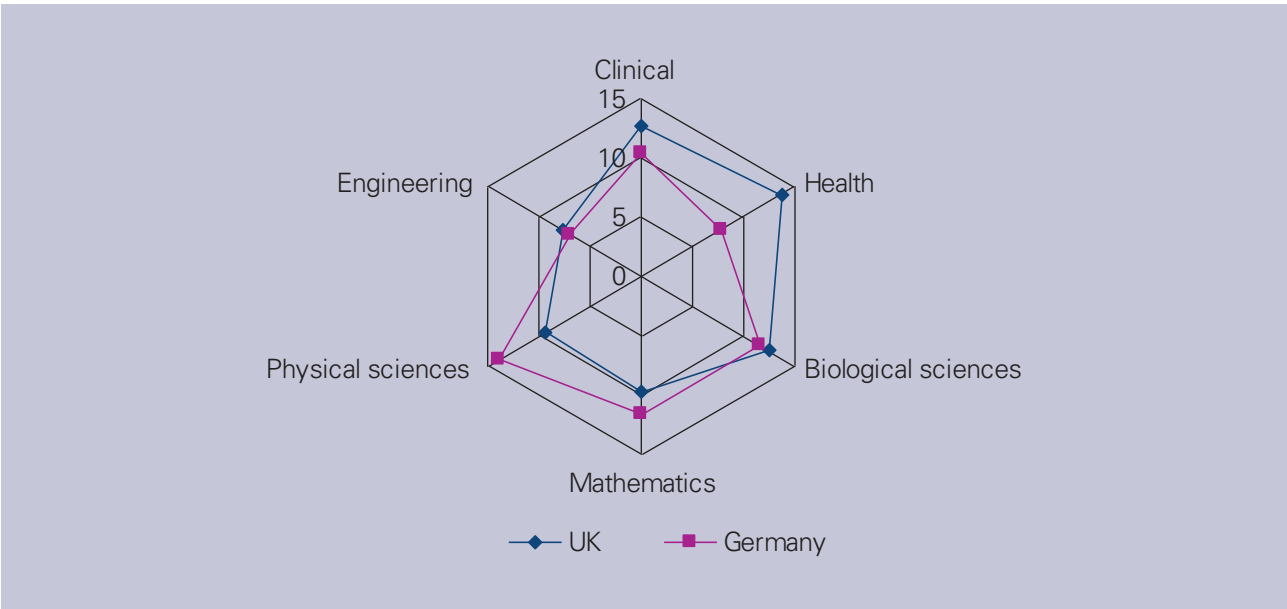
Figure 5.5 compares the frequency with which British and German scientific papers were cited in 2008. The UK has a heavier footprint than Germany in clinical and health-related subjects, whereas Germany is stronger in the physical sciences.

Figure 5.4: Share of World Citations by Discipline, 2008



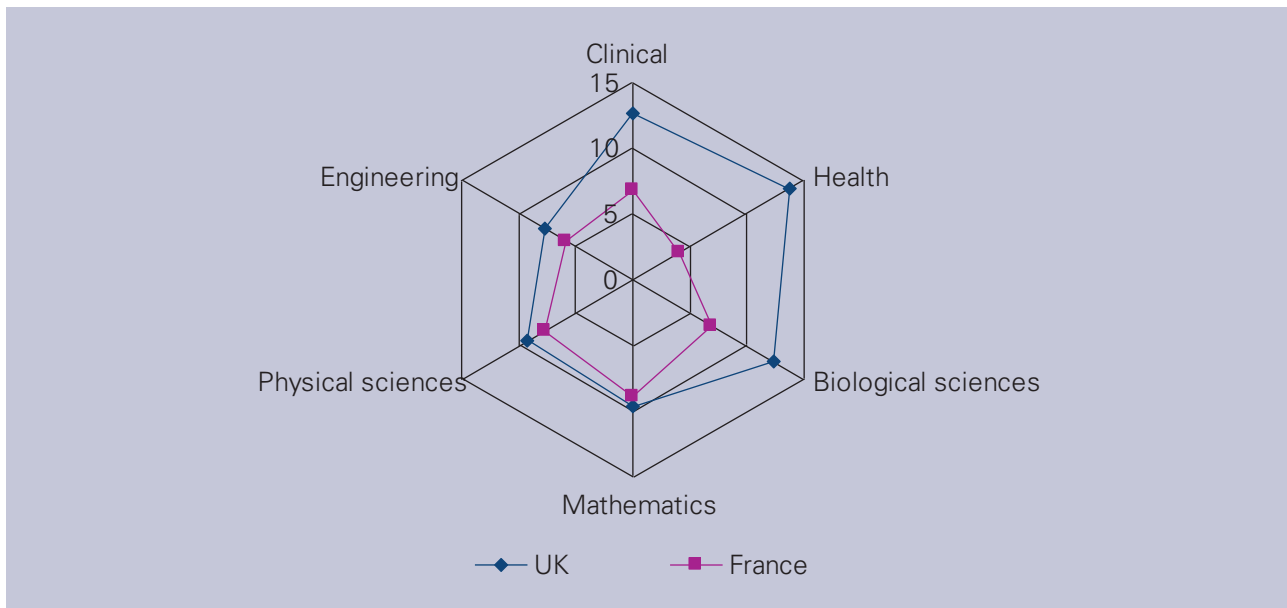
Source: DIUS (2009).

Figure 5.5: Share of world citations 2008 (per cent) UK and Germany



Source: Evidence Ltd.

Comparing the UK with France, British scientific papers were cited more frequently in all subjects but much more so in the life sciences.

Figure 5.6: Share of world citations 2008 (per cent) UK and France

Source: Evidence Ltd.

The quality and distinctive character of British medicine has also been influential. It has been argued by Henderson et al (1999) that science has a higher status within the UK medical profession than it does in Continental Europe, where the doctors have less scientific preparation than is typical in either the UK or the United States. Medically orientated research within Continental universities has tended to have a marginal role as compared to patient care. According to Braun (1994), in continental Europe, medical schools and hospitals are usually part of a single organisational entity, whereas in the US and the UK medical schools are usually independent of hospital administrations and are closely associated with universities.

Of major importance to this industry is the UK's system of publicly-funded research. The National Institute for Health Research (NIHR), the Medical Research Council (MRC) and the Biotechnology and Biological Sciences Research Council (BBSRC) are the largest public sources of research funding, last year spending budgets of around £800m, £700m and £400m respectively.¹⁷³

The MRC has a long tradition of producing excellent basic science, and since its establishment in 1913 has funded 29 Nobel Prize winners.¹⁷⁴ The major strength of the MRC is fundamental biomedical research, in which the UK is a world leader. The discovery of penicillin and the structure of DNA took place in UK laboratories. The UK's translation of laboratory research into applications is also impressive. For example, a team at the University of Leicester, led by Alec Jeffreys, used molecular biology techniques to study genetics variation in human DNA, resulting in the discovery of DNA fingerprinting in 1984.¹⁷⁵ This has also revolutionised genetic

¹⁷³ Other research councils also fund health and medical research, in particular EPSRC and ESRC.

¹⁷⁴ The latest of these was awarded this year for chemistry to Dr Venkatraman Ramakrishnan of the Medical Research Council Laboratory of Molecular Biology (jointly with two other researchers) for studies of the structure and function of the ribosome. Ribosomes produce proteins, which in turn control the chemistry in all living organisms.

¹⁷⁵ Cooksey (2006).

markers for disease and the way that organs available for transplantation are matched with patients, and it is also commonly used forensically in criminal investigations. The isolation and reproduction of monoclonal antibodies in 1975 was originally developed by Cesar Milstein and George Kohler at the MRC Laboratory of Molecular Biology as a research tool to study the immune system.

Important contributions are also made by charities. The Wellcome Trust, Cancer Research UK and the British Heart Foundation, the three largest individual funders, spend over £600 million, £250 million and £60 million a year respectively. The Wellcome Trust's Sanger Institute in Cambridge, which was established in collaboration with the MRC, was responsible for almost a quarter of the total sequences in the Human Genome Project. It recently announced that it had, for the first time, mapped the complete genetic codes of two human cancers. This is expected to transform the treatment of the disease, allowing every tumour to be targeted with personalised therapy.

Publicly funded research has also played a central role in the origins of the British biotechnology industry (Celltech, Cantab Pharmaceuticals, and PPL Therapeutics). The technology for genetic engineering of livestock was first developed at the Institute of Animal Physiology and Genetics and funded by the Agricultural and Food Research Council.

The Technology Strategy Board has also provided financial support for the life sciences. Since its inception in 2004 it has run six collaborative research and development competitions in this area, offering £64 million in grant aid. For example, as part of an £21.5m programme in regenerative medicine (£18m of funding from TSB and £3.5m from Research Councils), the TSB's first two competitions will result in over 40 British companies receiving over £4.5m to support R&D activities in the area of regenerative medicine therapies. Another example of TSB support for life sciences is its partnership with Ingenza and Novacta Biosystems to find faster, better and cheaper routes to new medicines by developing new biocatalytic processes to prepare optically pure beta amino acids and chiral amines, which are required by the pharmaceutical industry worldwide.

To conclude on this aspect, the UK's record in science generally, and in the disciplines that are relevant to the industry, is outstanding. It owes much to the UK's publicly-funded medical research system. Pharmaceutical companies are attracted to the UK in order to tap into this research infrastructure. "The quality of the health research base, combined with a national health service, creates a unique selling point that attracts R&D investment from the pharmaceutical, devices and biotechnology industries".¹⁷⁶

THE GOVERNMENT'S APPROACH TO USE OF MEDICINES IN THE NHS

There are essentially two aspects to the Government's role in NHS use of medicines: ensuring that they are safe and reliable; and establishing whether they offer value for money. The first – regulatory – aspect is the responsibility of the Medicines and

¹⁷⁶ Cooksey (2006) paragraph 1.2.

Healthcare products Regulatory Agency (MHRA), an executive agency of the Department of Health responsible for ensuring that medicines and medical devices work, and are acceptably safe. The experience with thalidomide kick-started the regulation of medicines in the UK. Thalidomide was prescribed during the late 1950s and early 1960s to relieve morning sickness in the first few months of pregnancy, but caused serious birth defects. In a bid to prevent a similar occurrence, the Committee on Safety of Drugs was set up in 1963. This subsequently became the Committee on Safety of Medicines (CSM) under the terms of the Medicines Act of 1968, which required medicines to be licensed before being allowed onto the UK market. The Medicines Control Agency was created in 1989, and merged with the Medical Devices Agency to become the MHRA in 2003. Many of the provisions of the Act have now been superseded by regulations implementing European legislation on medicines.

An important question for the industry is the speed with which new medicines receive marketing approval. Comparing 64 medicines that were approved by both the US Federal Drug Administration (FDA) and the MHRA, Cohen et al (2006)¹⁷⁷ concluded that marketing authorisation was obtained more quickly in the US. However, “patient access” has other dimensions than speed of marketing approval. A more nuanced comparison, which compared eight sub-dimensions of patient access to a sample of commonly used best-selling medicines in the US, the UK, France and the Netherlands (Cohen et al., 2007)¹⁷⁸, concluded that patient access took longer in the US. The relevant PICTF indicator (average time from the first world application for a market authorisation to launch) suggests that in the period 1999-2003, the UK was a little slower than the US (two years compared to 1.6 years), but it was quicker than some other comparator countries (Japan, 3.5 years; France and Italy, about 2.5 years). Overall, the UK appears to be competitive in this respect.

A 2005 comparison of the up-take of 40 medicines in comparator (OECD) countries indicated that the UK scored less well in respect to the diffusion of new medicines once they were approved. The median up-take in the UK one year after product launch was only 17 per cent of the PICTF average, rising to 54 per cent of the average five years after launch.¹⁷⁹ The share of the UK market accounted for by products launched within the last five years was about 17 per cent – lower than in the US (25 per cent) and in France and Germany (22 per cent).

Guidance on the value for money of new medicines is provided by the National Institute for Health and Clinical Excellence (NICE). NICE assesses comparator products (Single Technology Appraisals) against a common standard.¹⁸⁰ A technology is likely to be approved if it is expected to provide health benefits equivalent to one additional year of life at full health at a cost of £20,000-30,000 or less. This cost-effectiveness threshold is a guide to decision-making, not a rule. Its purpose is to reflect the patient benefits that could be gained through the alternative use of funds – the health gains from treatments that must be displaced in order to

177 Cohen et al (2006).

178 Cohen et al (2007). The eight sub-dimensions of patient access to pharmaceuticals were: marketing approvals, time of marketing approval, coverage, cost sharing, conditions of reimbursement, speed from marketing approval to reimbursement, extent to which beneficiaries control choice of their drug benefit, and evenness of the availability of drugs to the population.

179 Pharmaceutical Industry Competitive Task Force (PICTF), (2005).

180 National Institute for Health and Clinical Excellence. Guide to the methods of technology appraisal. London: NICE, 2008.

fund the new medicine. If a new medicine generates less benefits than the treatments it would displace, then patients overall would be worse off if the NHS were to purchase the product.

Although NICE will not negotiate or publicly set or indicate prices, its processes and the PPRS are linked in the sense that companies need to consider the likely outcome of a NICE appraisal when setting the price of a medicine, or considering whether to submit a medicine for appraisal at all. One global player observed that “late-stage cancer molecules will not get past NICE”, so that it is not worth even submitting them (though it is worth noting that this perception is inaccurate: some such medicines have been positively appraised by NICE). There is a clear political consensus in the UK that evaluation of clinical and cost-effectiveness by NICE is the right approach to allocating the NHS budget. Moreover NICE is globally recognised as the clear leader in its field, and sets the gold standard for evaluation of health technologies.

NICE's approach has raised some concerns among industry stakeholders. One is that its Technology Assessments may delay the introduction of new medicines. A new molecular entity (NME) typically takes 12 years to reach market authorisation.¹⁸¹ Further delays eat into what then remains of the 20-year patent life, making it harder to recover development costs. In recognition of the importance of timely appraisal, NICE is now able to begin work on assessing a medicine at the same time it is submitted for regulatory approval. This means NICE can issue guidance within 3-6 months of a product being granted a marketing authorisation.

Critics argue that other countries that spend similar per capita amounts on health care are approving treatments that NICE is turning down. This does not itself imply that the UK is taking the wrong decisions compared to other countries; an additional year of life might be valued more in other countries, especially if they are wealthier than the UK, or, in view of NICE's reputation, it is quite possible that those countries are prescribing inefficiently.

NICE was created to help the NHS prioritise investment in new and existing technologies, in order to inform decision making. It has become the de facto arbiter on whether (and to what extent) new medicines represent sufficiently good value for money that they should be adopted across the NHS. Primary Care Trusts (PCTs) may disregard a negative Technology Assessment but they would be reluctant to do so; conversely, if NICE approves a medicine, NHS bodies are required to provide funding to implement NICE appraisal guidance within three months.¹⁸² In this way, NICE's actions can indirectly impact competition in the UK pharmaceuticals market, and it plays a role in informing the purchaser – the NHS.

A recent study showed that most NICE approved medicines do quickly reach their predicted levels of usage¹⁸³ suggesting that NICE guidance is adhered to. The report compared the ‘predicted’ use of medicines, (calculated using the expected number of eligible patients, the average dose and average length of treatment), with their actual or ‘observed’ use. The report showed that out of the 12 appraisals where a

181 DiMasi et al, op. cit. Around 35 per cent of new drugs fall into this category.

182 This statutory funding requirement applies only to NICE's technology appraisal programme, which deals with the great majority of new drugs, and not to its other strands of guidance (such as clinical guidelines and public health guidance).

183 See: www.ic.nhs.uk/pubs/niceappmed.

comparison could be made, observed use by the NHS in England in 2008 was higher than predicted use for seven and lower for five.

NICE addresses a fundamental market failure – to do with information asymmetry. In providing a consistent approach, and collecting and assessing the relevant information, NICE helps the market to work effectively. But there is also a sense in which NICE is restricting the NHS market. For example, some argue that if NICE concludes that only one of a number of competing new treatments meets its standard, the other contenders are effectively eliminated and competition in this particular segment of the NHS market is, for the present, curtailed. On the other hand, some stakeholders argue that NICE skews the NHS market too far in favour of new drugs, particularly given the specific statutory requirement on PCTs to fund NICE-recommended medicines even if they believe that doing so may displace alternative treatments in which they would rather have invested.

A number of policy responses have increased access to new medicines, including the “Innovation Pass” developed as part of the Office for Life Sciences’ work (see below), and risk-sharing initiatives. Risk-sharing was proposed by Janssen-Cilag when NICE rejected its treatment of multiple myeloma, bortezomib (Velcade), on cost grounds in 2006.¹⁸⁴ In a move that was seen as landmark in the industry, the company then offered to reimburse the NHS with the full cost of treatment for those patients that have a less than 50 per cent reduction in serum M-protein. Those showing a complete or partial response (reduction of 50 per cent or more) will have their treatment continued and paid for by the NHS. The proposal was amended and then recommended by NICE in 2007, and was hailed by the NICE Chief Executive, Andrew Dillon, as “a win-win solution for multiple myeloma patients and the NHS.”

Other risk-sharing arrangements for expensive cancer medicines have since emerged in the context of NICE appraisals. For example, Merck-Serono offered such an arrangement for Cetuximab *Erbitux* in metastatic colorectal cancer, which involved refunding PCTs the cost of the medicine used for patients that fell into a pre-agreed ‘non-responder’ category at up to six weeks.¹⁸⁵ Such schemes can be effective in facilitating patient access to new medicines, though there are concerns in the NHS about the additional administrative burden they can impose on front-line staff.

The Government recognised that market access for medicines for small patient populations may be inhibited where data to demonstrate cost-effectiveness is so far limited. The Office for Life Science proposed the “Innovation Pass”, a three-year initiative for selected medicines which will be funded for a time –limited use across the NHS from a new ring-fenced budget, before going through a full NICE technology appraisal. The Pass will be piloted with a budget of £25 million in 2010/11.¹⁸⁶

¹⁸⁴ Myeloma is a devastating form of cancer, which is currently incurable, but treatable. Nearly 4,000 people in the UK are diagnosed with myeloma each year and there are 20,000 myeloma patients in the UK at any one time. The life expectancy of a newly-diagnosed myeloma patient is 3-5 years. Eight people die from myeloma daily. At around £3,000 per cycle of treatment, the incremental cost effectiveness ratio ranged from £33-38,000 per QALY for treatment of first relapse to £77-107,000 per QALY for subsequent relapses i.e. exceeding the £30,000 per QALY threshold that NICE tends to use as a reference point.

¹⁸⁵ “More Velcade-Style Risk-Sharing In The UK?”, *Europharma Today*, January 21, 2009.

¹⁸⁶ Life Sciences Blueprint: A Statement from the Office for Life Sciences, July 2009, Paragraph 2.5.

To conclude on the Government's approach to use of medicines, the studies that have been reviewed here suggest that the UK is competitive in respect to the time required to secure market authorisation for new medicines, but that it may score less well in respect to the *diffusion* of new medicines, once they are approved. NICE is widely respected for having established a new standard for evaluating treatments. NICE has in some sense become the de facto "gatekeeper", deciding on which new medicines should be adopted (or, more usually, how they should be adopted) by the NHS – thereby mitigating the information failure inherent in purchasing treatments without knowledge of their cost-effectiveness. Critics argue that other countries that spend similar per capita amounts on health care are approving treatments which NICE are turning down. This does not itself imply that the UK is taking the wrong decisions compared to other countries. A number of policy responses have increased access to new medicines, including risk-sharing initiatives and the "Innovation Pass".

PROVIDING FISCAL INCENTIVES FOR INVESTMENT

According to McKinsey, R&D incentives in the UK are comparable with those of the US and major European countries.¹⁸⁷ R&D tax credits provide significant support for R&D in the UK. In April 2008, R&D tax credits were raised from 150 per cent to 175 per cent for SMEs, and from 125 per cent to 150 per cent for large companies.

In addition the Research and Development Allowance (R&DA) allows plant, machinery and buildings to be immediately written off against profits. This treatment is more generous than that for similar expenditure for non-R&D activity, where there is a six per cent depreciation allowance for buildings and a 20 per cent depreciation allowance for plant and machinery. It is not, however, a very significant subsidy to R&D, because about 90 per cent of R&D is current expenditure.

Tax incentives do appear to be effective. A 10 per cent fall in the cost of R&D stimulates just over a 1 per cent rise in the level of R&D in the short-run, and just under a 10 per cent rise in R&D in the long-run.¹⁸⁸

According to McKinsey, R&D incentives in the UK are comparable with those of the US and major European countries.¹⁸⁹ R&D tax credits provide significant support for R&D in the UK. In April 2008, R&D tax credits were raised from 150 per cent to 175 per cent for SMEs, and from 125 per cent to 150 per cent for large companies.

Also relevant to pharmaceutical companies is the rate of Corporation Tax. At 28 per cent, the UK's corporate tax rate is at its lowest ever level and is the lowest Corporation tax rate of the major G7 economies, lower than that of the USA (40 per cent). However, industry points to low rates available elsewhere, for instance in Ireland, where the corporate tax rate is only 12.5 per cent. Although this underplays the importance of other factors such as skills, infrastructure, legal system, and access to markets.

187 Sections 136 to 139, Capital Allowances Act 1990.

188 Bloom, Griffith and Van Reenen (2002). This study was based on an econometric model of R&D investment using a panel of data on tax changes and R&D spending in nine OECD countries over a 19-year period (1979–1997).

189 McKinsey (2005) Clinical Research in the UK.

Innovative approaches to taxing income from R&D have been adopted in some EU countries. The Netherlands introduced the “the patent box” in 2007, whereby income derived from a patent (or from 2008, a special R&D-qualification) was taxed at an effective rate of 10 per cent. This rate will be lowered to 5 per cent as of 1 January 2010.¹⁹⁰ In 2008, Spain also announced it would introduce a Patent Box. While club (the Netherlands, Belgium and Luxembourg already have schemes, with effective tax rates on net intellectual property income of 10 per cent (5 per cent from 1 January 2010), 6.8 per cent and 5.9 per cent respectively. The rate in Spain is similar, depending on the profit margin of the activity.

In the December 2009 Pre Budget report, the UK Government announced that it would introduce a Patent Box. From April 2013 it will apply a reduced rate of Corporation Tax of 10 per cent to income derived from patents (from a top rate of 28 per cent). Government will consult with business on the detailed design of the Patent Box. The announcement was widely welcomed by industry. GSK commented that “the new system will significantly improve the UK’s international competitiveness and encourage long-term inward investment in the UK from companies seeking to build their future high technologies and manufacturing capability.”

To summarise, although tax is rarely the most important factor in assessing international competitiveness, tax incentives for R&D have been shown to be important, for industry in general, and international differences in corporation tax rates could play some role. The UK is broadly competitive with respect to corporation tax rates although there is some risk that smaller countries with educated workforces, could be perceived to be more attractive to industry. This is an area that the Government could keep under review.

PROVIDING INFRASTRUCTURE

The physical infrastructure is important to this industry as it is to others. Some of the locations which are best suited to the industry happen also to be rural or residential areas in which expansion, and/or new transport links, can pose planning problems.

In 1997 the Wellcome Trust submitted a planning application to South Cambridgeshire District Council to create a 44,000 square metre business park next door to its Hinxton Hall genetic research station, the home to the Human Genome Campus, 10 miles south of Cambridge. Although the new development would bring industry and academic scientists together to allow data emerging from the Human Genome Project to be translated into practical health benefits, South Cambridgeshire District Council rejected the application. Local roads and housing stock could not support the flood of new employees. The Government upheld the council’s objection. After five years of discussions, a compromise solution was reached: planning permission was granted in 2002 for a smaller (27,000 square metre) extension.

Another example is Harlow, where GSK has a major laboratory, employing some 2,500 people. Harlow was designed by Sir Frederick Gibberd and built in the 1950s according to principles that fit well with the modern concept of sustainability, with

¹⁹⁰ PricewaterhouseCoopers (2009)

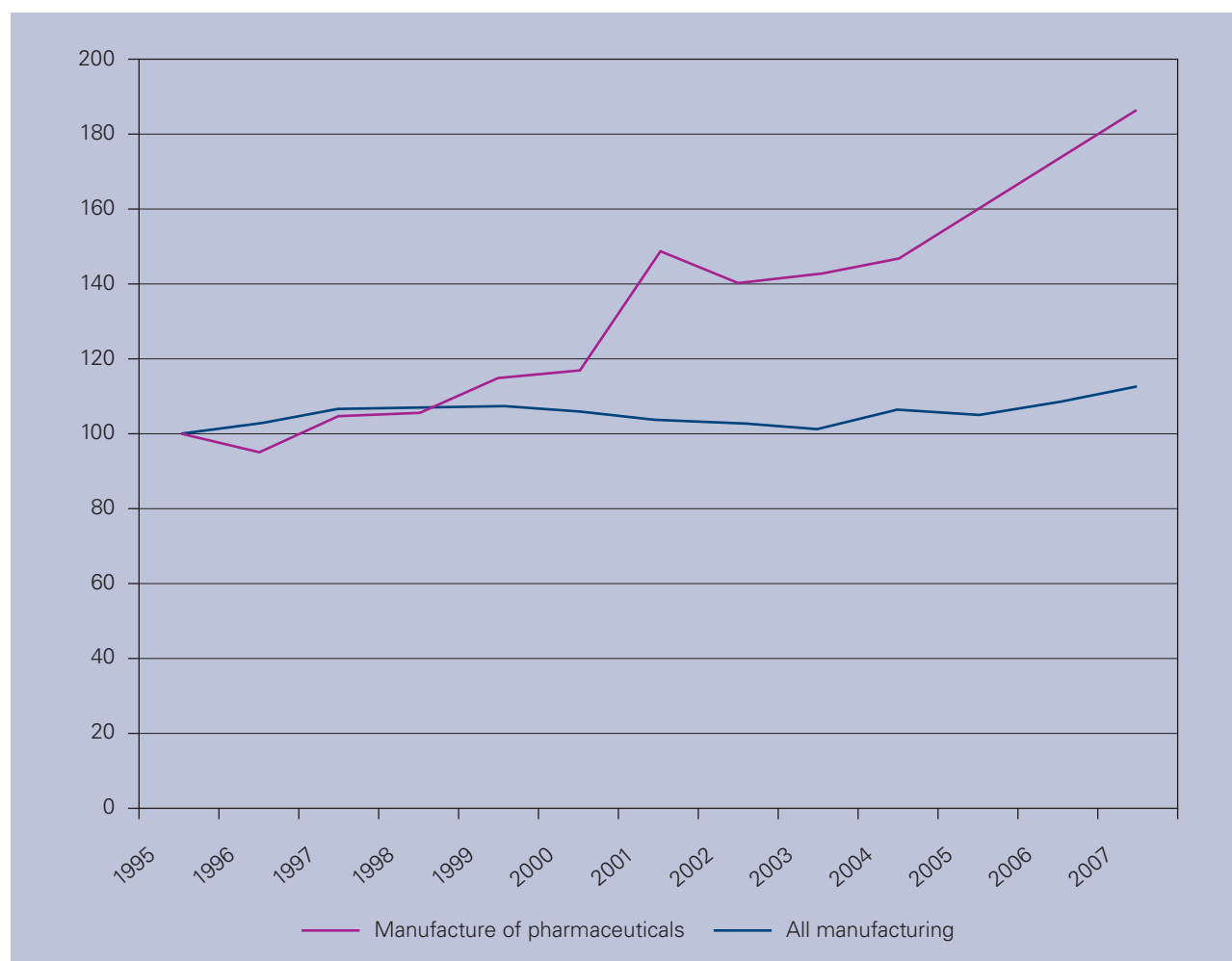
neighbourhoods separated by green spaces. It is an excellent business location, with high average earnings, close to London, Cambridge and London's Third Airport at Stansted. In practice, however, there is a problem. The M11 was built to the east of the town, whereas its town centre and industry is to the north and west. Consequently, the town's link to the M11 – the A414 – runs through the town, creating congestion. It takes GSK staff a long time to get to work and also to reach other GSK facilities.

The car is the common thread linking these cases. Both Cambridge and Harlow are examples of infrastructures that support this industry well but, in their different ways, both are challenged to provide the road access that the industry needs.

5.4 The impact of the industry on the economy

The industry's economic impact is reflected in its growth, productive use of resources, and trade. Whereas the UK's manufacturing sector hardly grew at all over the last decade, the pharmaceutical industry grew rapidly.

Figure 5.7: Value added: Manufacturing and Pharmaceuticals, 1995 = 100



Source: Office for National Statistics, Annual Business Inquiry. Value added is measured at basic prices. Employment is the average during each year. Manufacturing is defined as SIC (2003), Section D. The pharmaceutical industry is defined as the Manufacture of pharmaceuticals, medicinal chemicals and botanical products, SIC (2003) 24.4.

USE OF RESOURCES: MANPOWER AND CAPITAL

A key question to ask about any industry or business is: how well does it use its resources? The labour productivity of the pharmaceutical industry is markedly higher than that of the manufacturing sector, and growing more rapidly¹⁹¹

Figure 5.8: Productivity: Manufacturing and Pharmaceuticals



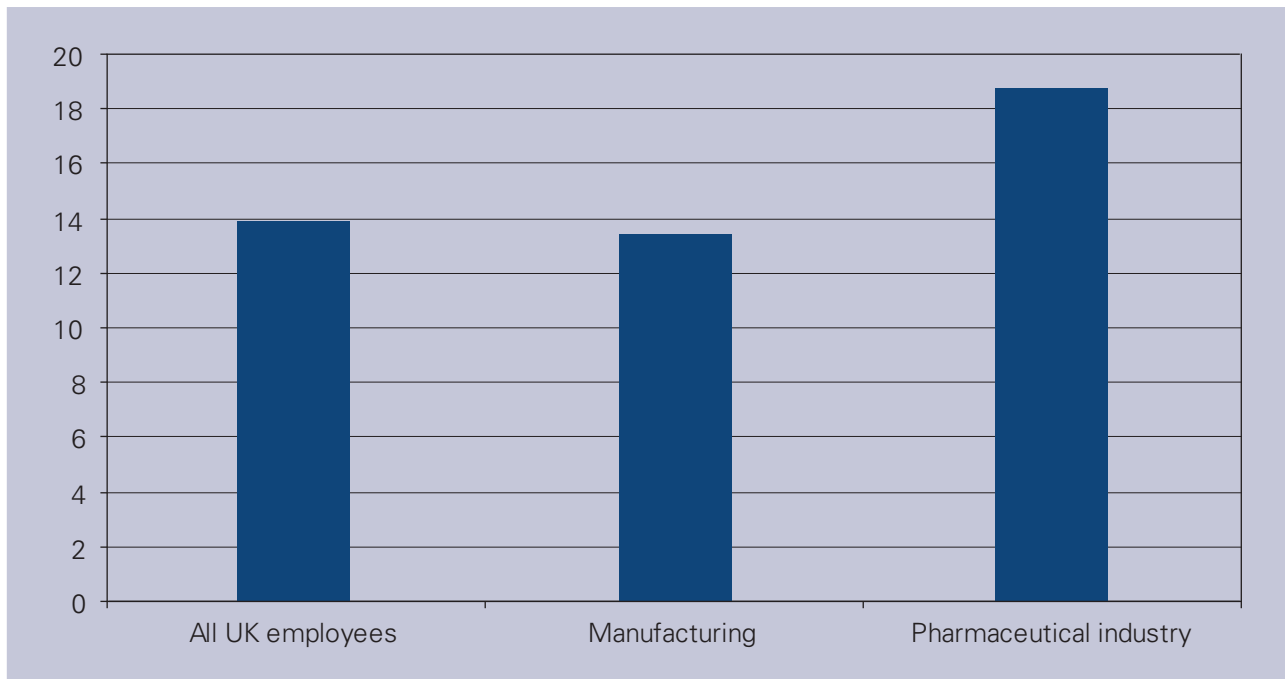
ONS, Annual Business Inquiry, release date 16/06/2009

Source: as for previous figure.

The industry achieves this high productivity partly because it is so capital-intensive and also because it employs high-quality manpower, to judge from the comparatively high average rates of pay in the industry. In 2008, the average hourly earnings (excluding overtime) in the pharmaceutical industry were over one-third higher than those of all employees in the economy. They were also significantly higher than those in manufacturing.

¹⁹¹ Manufacturing is the comparator here because it is the sector to which the industry is classified. It could be argued that manufacturing is a misleading comparator, since manufacturing activities represents a small – and diminishing – proportion of the industry's total costs, but that is also true of many industries in the sector.

Figure 5.9: Average hourly earnings, 2008



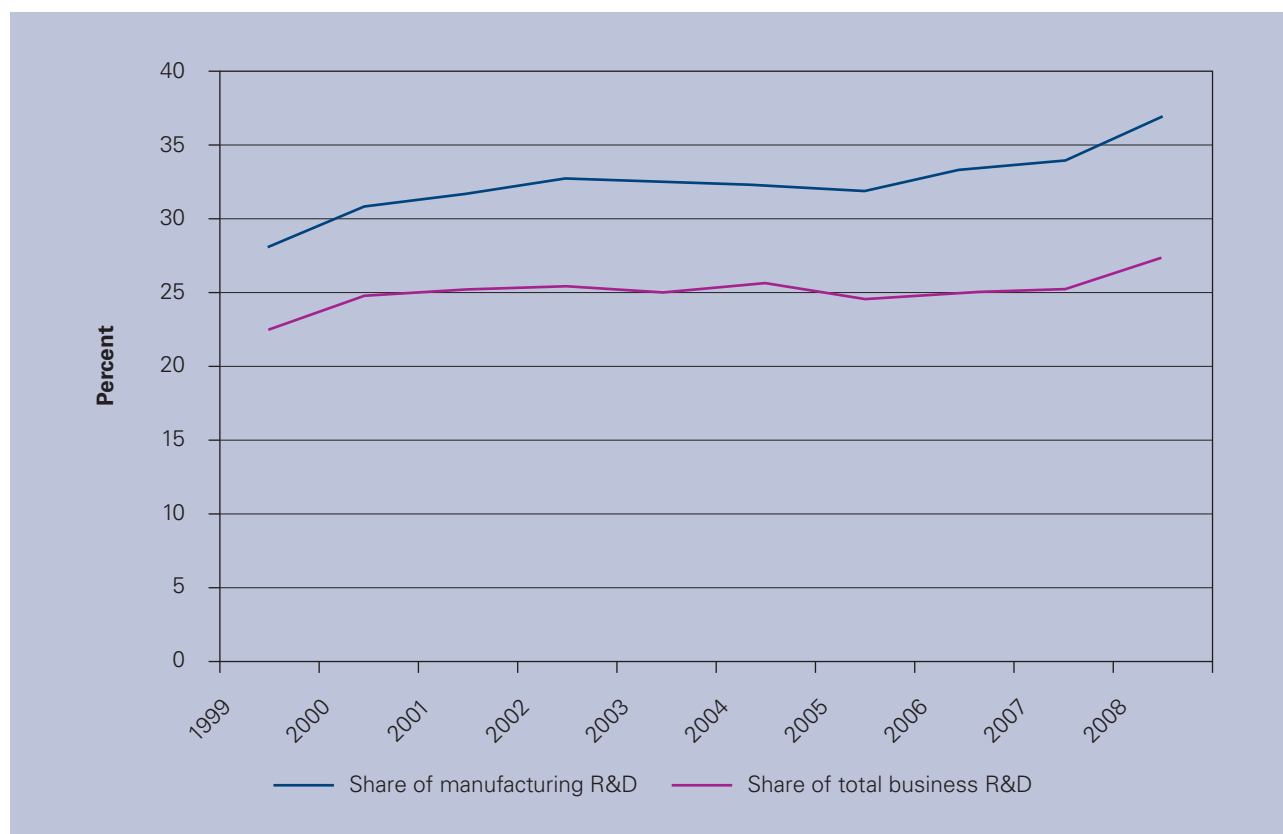
Excluding overtime.

Source: Annual Survey of Hours and Earnings, Office for National Statistics.

At the same time, it is one of the industry's achievements that it is able to generate average earnings of this magnitude.

EXPENDITURE ON R&D

The industry spent about £4.3 billion on R&D in 2008 – over one-third of the total amount spent on R&D by the entire UK manufacturing sector.

Figure 5.10: The pharmaceuticals industry's share of business R&D

Source: ONS BERD 2007, Tables 1 and 2

The spend on R&D in the UK is about £2,000 million greater than would be the case if the industry were a representative “slice” of the global industry, with a R&D/sales ratio, for illustration, similar to those of GSK and AstraZeneca (about 15 per cent). This illustrates the degree to which the UK has become a centre for pharmaceutical R&D.

SPILOVER EFFECTS

Spillover effects refer to benefits which individuals enjoy, without paying for them, as a result of actions by another. R&D generates spillovers because most of the benefits from innovation accrue to consumers and imitators. Spillovers are enormous in this industry. It has been estimated that society as a whole may gain an annual return of 40 per cent from investment in R&D in the pharmaceuticals sector, while the company making the investment only receives 11 per cent.

TRADE AND INVESTMENT

Table 5.5 compares the industry's trade performance with that of manufacturing, in terms of “self-sufficiency”: i.e. the extent to which the nation's imports of the products concerned are covered by earnings from its exports of those products. On this metric, the pharmaceutical industry performs twice as well as the rest of the UK manufacturing sector.

Table 5.5: Trade performance: pharmaceuticals and manufacturing, 2008

Trade performance: pharmaceutical and manufacturing, 2008			
Sector	Exports £billion	Imports £billion	Exports/ Imports
Manufacturing	223	296	75%
Non-pharmaceutical manufacturing	205	284	72%
Pharmaceutical industry	18	12	152%

Source: UK Trade in Goods Analysed in Terms of Industries Quarter 4 2008, ONS, 2009.

This comparison does not convey the full measure of the industry's engagement with world markets: foreign direct investment also plays a significant role.

The UK is Europe's leading recipient of R&D inward investment, and the pharmaceutical industry is the largest component of this. There were 140 inward investment projects in the life sciences industry in 2008-09. Pfizer announced plans to spend up to \$60 million on a stem cell research centre in Cambridge.¹⁹²

To summarise, this industry is the star of the UK's manufacturing sector. Through intensive research effort it has achieved rapid growth and exceptional productivity.

5.5 Competitive threats

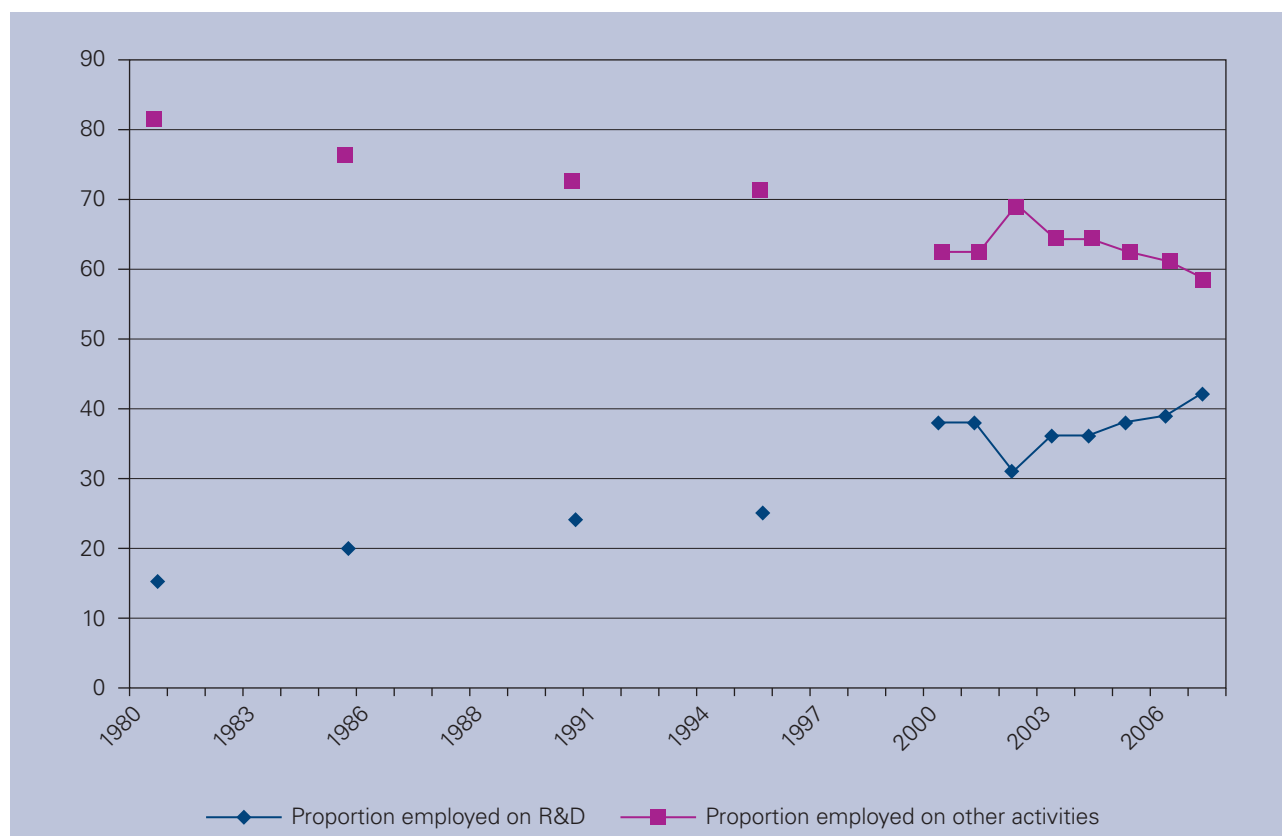
This encouraging story should not overlook the fact that, like other manufacturing industries, the pharmaceutical industry is "hollowing out": its manufacturing operations are migrating abroad. A long-term shift is taking place towards employment in R&D, and away from other activities, and this accelerated between 2005 and 2007.

The UK pharmaceutical industry is heading towards becoming a base for R&D and administration. Does this matter, when the R&D jobs are the better paid? It matters in the sense that the manufacturing jobs are also high quality jobs, involving technical skills, and are well paid, compared to the alternatives that are available to those concerned. There would be a concern if R&D followed manufacturing operations offshore. Although there are some synergies to be derived from co-locating R&D and manufacturing, because the precise way in which medicines are formulated, manufactured and presented has a bearing on their effectiveness and appeal, it is not clear that these have historically been decisive factors in the industry's location decisions.

However, there is some evidence that in recent years companies are increasingly outsourcing some research activities. Fewer firms have large in-house clinical research units as they increasingly rely on Contract Research Organisations (CROs) to run the clinical trials. According to Business Insights (2006), CROs now account for over 40 per cent of annual research spending by pharmaceutical firms, compared to 4 per cent in the early 1990s.¹⁹³

¹⁹² UK Inward Investment 2008/2009: UK – Your Springboard for Global Growth, Report by UK Trade & Investment.

¹⁹³ See also BIS (2010)

Figure 5.11: The industry's shift towards jobs in R&D (per cent of employment)

Source: ONS

The UK's hold on the industry's R&D activities is not as secure as it was. The old research model is no longer generating new molecules as cost effectively as it once did, so R&D is now being conducted differently. The days of the large, vertically integrated R&D laboratories may be coming to an end, to be replaced by smaller, more dispersed centres, networked together. There is less emphasis on screening candidate molecules *in vivo*, and more on computer modelling ("*in silico*"). Clinical trials are now possible in countries in which this was not previously so, such as the Czech Republic and Turkey. A major global player reported that it is no longer conducting late-stage, large-scale trials in the UK. More companies are involved now in development. Like manufacturing, R&D is becoming exposed to global competition. The R&D of the industry's leaders is migrating towards the rapidly growing economies – Pfizer to China, Amgen to Brazil.

5.6 The impact of Government: key points

Such is the political importance of health today that democratic Governments play a central role in all its aspects. This is quite a recent development. It was not until 1968, for example, that comprehensive legislation was passed in the UK on the safety of medicinal drugs (Corley (2003)). Political choices have an important bearing on the industry's supply and demand. As purchaser, Government has conducted its negotiations with the UK's R&D-based pharmaceutical industry for over half a century within the framework of the PPRS. Compared to arrangements in some other countries, this has provided a number of advantages for the industry:

- it is a voluntary arrangement, not a regulation;
- it recognises the costs of R&D;
- it allows free pricing;
- its five-year settlements have provided stability.

The fact that a number of countries, whose Governments set the prices of medicines in their market, use UK prices as reference prices is an endorsement of the PPRS.

Although the UK is a small part of the overall world market, the NHS is a major customer of pharmaceutical products. In comparison to other countries:

- Spending per capita on medicines is modest in the UK, compared to comparator countries;
- Recourse to generic substitutes is high, and encouraged;
- The rate of adoption of new medicines has on average been slower than the European average.

In respect to the safety of medicines, the MHRA's judgements are highly regarded internationally. The speed with which it processes applications is comparable to that in comparator countries (marginally slower than the US, but quicker than a number of EU countries).

NICE has set a new and internationally recognised standard for assessing the value for money offered by new medicines. However, its actions have implications for the industry: its deliberations add delays to the adoption of new medicines and while its judgements have the status of guidance, they effectively rule out the use of some medicines by the NHS, or restrict their use, if they do not provide sufficient benefits to outweigh their opportunity costs. This means that some medicines that are prescribed elsewhere in the EU are not available through the NHS.

NICE's long term impact on the UK pharmaceutical industry is difficult to predict. One view is that it will have no impact at all. It could be argued, that what matters to the industry is whether the UK remains a competitive location for pharmaceutical research, not the appetite of the UK market – accounting for around just four per cent of the global market – to adopt new medicines.

A more nuanced view is that, pharmaceutical market conditions may have a subtle influence. Proximity to the latest pathways of medical care may have formed part of the UK's appeal as a location for pharmaceutical R&D, and that appeal may become less compelling if the UK declines to adopt treatments that are being adopted elsewhere. The UK's appeal as a location for clinical trials – already in decline – could diminish, too. Trials are opportunities to acquaint clinicians with new medicines; they lose this value if the clinicians concerned will not be in a position to prescribe the new medicine.

A third view is that, despite the observations above, NICE is actually a positive for the industry. The NHS is now a better informed customer as a result of NICE's guidance and in this sense NICE is reinforcing one of the competitive advantages that were identified by Porter – a sophisticated and demanding home market. NICE's drive for better value for money is a leading indicator of the direction of travel, in Europe and elsewhere, and for that reason, is a process in which pharmaceutical companies wish to understand and to be effective participants.

The UK is broadly competitive in respect to its rate of corporation tax and has a system of R&D tax credits that is attractive to all companies. The UK is not currently one of the four EU countries that now operate the "Patent Box", which taxes earnings from intellectual property at about five per cent, but it will be from 2013-14, when income from patents will be taxed at 10 per cent.

The critical infrastructure for this industry consists of a set of institutions – the medical schools, universities, and support for R&D by NIHR, MRC, BBSRC, other research councils and charitable research foundations. Government has played a major role in supporting medical science, and this research has a proud record (Penicillin, DNA, etc.). Today, the MRC is supporting, for example, the Genome Project. Notable features here include:

- the outstanding tradition of science-based medicine in the UK's hospitals and medical schools;
- the quality of the UK's applied science, and its orientation towards the subjects that are relevant to the pharmaceutical industry; and
- the MRC's judgements and support (it has supported 29 Nobel Prize-winners).

The Government itself also provides support, via the Technology Strategy Board, for collaborative research for the life sciences.

The physical infrastructure is important to this industry, as it is to others. Some locations, such as Cambridge and Harlow, support this industry extremely well. However, even these can be challenged to provide the road access that the industry needs.

To conclude, there are a number of reasons why the pharmaceutical industry has prospered in the UK – outstanding science, much of it supported publicly, a science-based tradition of healthcare, many brilliant individuals, shrewd business decisions and a stable business environment. In addition, the NHS market has always been an open one, as illustrated by the market shares in Table 5.3, with no hint of a national champion policy.

The major lesson that could be learned from this chapter is the importance of a stable business environment with reliable supporting institutions. This needs to be conserved, mindful that the UK competes with many other countries, eager to attract this knowledge-intensive industry.

5.7 References

- BIS (2009), *Life Sciences Blueprint: A Statement from the Office for Life Sciences*, July, Paragraph 2.5.
- BIS (2010), Economics Paper No. 2: *Life Sciences in the UK – Economic analysis and evidence for 'Life Sciences 2010: Delivering the Blueprint'*.
- Bloom, N. and Van Reenen, J. (1998), "Regulating Drug Prices: Where Do We Go from Here?", *Fiscal Studies*, 19(3)3, 321–342.
- Bloom, N., Griffith, R. and Van Reenen, J. (2002), "Do R&D tax credits work? Evidence from a panel of countries 1979–1997", *Journal of Public Economics*, 85(1), 1-31.
- Braun, D. (1994), *Structure and dynamics of Health Research and Public Funding: an International Institutional Comparison*. Amsterdam: Kluver.
- Business Insights (2006), *Pharmaceutical Outsourcing Strategies, Market Expansion, Offshoring and Strategic Management in the CRO and CMO Marketplace*.
- Casper, S and Mataves, C. (2003), "Institutional frameworks and innovation in the German and UK pharmaceutical industry", *Research Policy*, 32(10), 1865-1879.
- Cohen, J., Cairns, C., Paquette, C. and Faden, L. (2006), "Comparing patient access to pharmaceuticals in the UK and US", *Applied Health Economics and Health Policy*, 5(3), 177-187.
- Cohen, J., Faden, L., Predaris, S. and Young, B. (2007), "Patient access to pharmaceuticals: an international comparison", *The European Journal of Health Economics*, 8(3), 253-266.
- Cooksey, D. (2006), *A Review of UK Health Research Funding*. HM Treasury.
- Corley, T.A.B. (2003), "UK Government Regulation of Medicinal Drugs, 1890-2000", *Business History*, 47(3), 337-351
- DiMasi, J.A., Hansen, R.W. and Grabowski, H.G. (2003), "The price of innovation: new estimates of drug development costs", *Journal of Health Economics*, 22(2), 151-185.
- DiMasi, J.A. and Grabowski, H.G. (2007), "The Cost of Biopharmaceutical R&D: Is Biotech Different?", *Managerial and Decision Economics*, 28, 469–479.
- Giraud, M. and Sussex, J. (2007), *Estimating Pharmaceutical Companies' Value to the National Economy: Case Study of the British Parma Group*, London: Office of Health Economics.
- Evidence Ltd. (2009), *International comparative performance of the UK research base*, report for BIS.

Graves, S. B. and Langowitz, N. S. (1993), "Innovative productivity and returns to scale in the pharmaceutical industry", *Strategic Management Journal*, 14(8), 593 – 605.

Henderson, R and Cockburn, I (1996), "Scale, scope and spillovers: the determinants of research productivity in drug discovery", *Rand Journal of Economics*, 27(1).

Henderson, R., Orsenigo, L. Pisano, G.P. (1999), *The Pharmaceutical Industry and the Revolution in Molecular Biology: Interactions among Scientific, Institution and Organisational Change*, in D.C. Mowery and R.R. Nelson (eds.), *Sources of Industrial Leadership; Studies of Seven Industries*. Cambridge, UK: Cambridge University Press.

National Institute for Health and Clinical Excellence (2008), *Guide to the methods of technology appraisal*. London.

NERA (2007), "Key Factors in Attracting Internationally Mobile Investments by the Research-Based Pharmaceutical Industry", A Report prepared for UK Trade and Investment and the Association of the British Pharmaceutical Industry.

Owen, G. (1999), *From Empire to Europe: The Decline and Revival of British Industry since the Second World War*. London: HarperCollins.

Office of Fair Trading (2007), *The Pharmaceutical Pricing and Reimbursement Scheme*.

Porter, M.E. (1990), *The Competitive advantage of Nations*. London: Macmillan.

Olson, M. K. (1995), "The Effects of UK Pharmaceutical Policy on Government Drug Expenditure: Cost Control and Incentives for R&D", *International Journal of the Economics of Business*, 2(1).

Pharmaceutical Industry Competitive Task Force (PICTF), (2005), *Competitiveness and Performance Indicators 2005*, published jointly by the Department of Health and the Association of the British Pharmaceutical Industry.

PricewaterhouseCoopers, "Netherlands: Government publishes 2010 tax package", *International Tax Review*, November 2009.

Taylor, D. (2003), "Regulating the Prices and Costs of Medicines in the United Kingdom", *Journal of Pharmaceutical Finance, Economics & Policy*, 12(3), 235-260.

Thomas, L. G. (1994), "Implicit industrial policy: the triumph of Britain and the failure of France in global pharmaceuticals", *Industrial and Corporate Change*, 3, 451–89.

6. UK Aerospace Industry

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6.1 Executive Summary

Aerospace is an example of a successful high technology industry in which the UK has a comparative advantage. It is currently dominated by a combination of domestic monopolies and world class firms (e.g. BAE Systems; Rolls-Royce), whose activities are mainly concentrated in the South-East, South-West, North-West and the Midlands. In particular it is characterised by;

Rising costs

- Aerospace equipment is costly in both development and unit production costs, and cost trends are upwards
- Aerospace is a decreasing cost industry for which volumes are an important driver of unit costs (via scale economies, learning effects etc)
- Entry into the sector is costly and there are strong incentives to collaborate, particularly given the escalation in development costs

The importance of Government

- For military aircraft, Government is a monopsony or major buyer able to use its buying power to determine Industry ownership, size, structure, conduct and performance
- Governments also provide extensive support for civil aircraft through their control over property rights in the form of landing rights and over-flying rights and their financial support for civil aircraft development
- The failure to achieve complete private venture only funding of large civil aircraft and engines has led to state launch aid but this policy is being reviewed by the WTO

Rapid technical progress

- It is an R&D-intensive and high technology industry with technology spill-overs (a source of market failure)
- Since the first manned powered flight in 1903 (Wright brothers), military aircraft have achieved speeds of some 2000mph; civil aircraft have travelled at supersonic speeds and jumbo jets can transport large numbers of passengers for long distances
- Wars have been a major technical driver with some of the technical advances eventually spilling-over to civil aircraft (e.g. design; engines; radar)

The Industry faces a range of uncertainties including new competitors, the WTO review of Launch Aid, the planned Defence Review in 2010 and developments in European defence equipment markets and industries. The Aerospace sector offers lessons for future industrial policy.

6.2 Terms of Reference

BIS required a sector case study examining the history, evolution and growth of the UK Aerospace Industry as one of Britain's successful sectors. The case study examines the establishment of the Industry and its key external events; the evolution of industry structure; its geographical concentration; and the impact of Government on the Industry's development.

A conclusion provides an overall assessment of the impact of the Industry, especially Government policy, on the overall UK economy. This overall assessment will consider various performance indicators such as output and employment growth, trade performance and innovation levels.

6.3 The Economics of the UK Aerospace Sector

This section discusses the economics of the Aerospace Industry, the rationale for Government intervention and an outline of its current structure in the UK.

CHARACTERISTICS OF THE AEROSPACE INDUSTRY

The aerospace industry has a number of characteristics which contribute to its distinctive economic structure, including:

- An increasingly long and costly development process
- The importance of volumes in driving unit costs
- High costs of entry into the market
- Strong incentives towards collaboration
- Strategic importance

Cost levels and time-scales

Aerospace equipment is costly in both development and unit production costs, and cost trends are strongly upwards. Also, on complex high technology aircraft projects, development can take many years. Some examples of cost levels and cost trends for military aircraft are shown in Tables 6.1 and 6.2.

Table 6.1: Examples of costs on military aerospace projects

Project	Unit production cost (£millions, 2006 prices)
Manned fighter/strike aircraft	70
Advanced trainer aircraft	17
Strategic transport/tanker aircraft	200
Attack helicopter	24
Anti-submarine helicopter	65
Stand-off missile	1.8
Reconnaissance UAV	5

Note: Data are for unit production costs.

Source: Pugh (2007).

Table 6.2: Cost trends for UK combat aircraft

Aircraft	Year	Cost index
Spitfire	1934	100
Vampire	1946	170
Hunter	1954	200
Lightning	1959	670
Harrier	1969	1670
Tornado	1979	2900
Typhoon	2003	5263

Note: Data are approximations and inflation adjusted.

Source: Hayward (1989, p6).

Cost-quantity relationships and learning economies

Quantity is a major determinant of unit costs and competitiveness. Long production runs allow fixed R&D costs to be spread over greater volumes. There are also economies of learning leading to productivity improvements with greater cumulative output (Tisdell and Hartley, 2008). As a result, aerospace industries are decreasing cost industries.

Costly entry

Entry requires high levels of technology and R&D spending to design, develop and produce modern military and civil aircraft (see Tables 6.1 / 6.2). Costly military projects are usually funded by Governments: hence, Government can also be a barrier to entry (Laguette, 2009).

Incentives to collaborate

High R&D costs and the economies of scale and learning in production provide the economic incentives for two or more nations to collaborate. In the ideal case, international collaboration results in cost savings compared with a national programme, as each nation shares R&D costs and benefits from scale and learning economies as the partners combine their production orders.

However, ideal case collaboration has never been achieved as each partner demands a 'fair share' of the high technology work, as well as its own flight testing centre and final assembly line; so increasing development costs by an estimated 50 per cent for each partner nation beyond the first (Pugh, 2007). Similar cost penalties apply to collaborative production while the international bureaucracy and international management arrangements inevitably add to development times (Hartley, 2008).

Aerospace as an economically strategic industry

Aerospace industries are high technology, R&D-intensive industries with technology spin-offs to the rest of the economy (e.g. radar; composite materials; jet engines). They are decreasing cost industries characterised by imperfect competition leading to monopoly profits. Government strategic trade policy providing state support for aerospace industries enables a nation to obtain a share of monopoly profits in world markets (e.g. Airbus: Lawrence and Braddon, 2001).

MARKET FAILURES IN THE AEROSPACE INDUSTRY

Aerospace markets are characterised by significant market failure, especially in defence markets. Governments are central to determining military demands. They are 'monopsony' or major buyers of military aircraft, helicopters and missiles and they can use their buying power to determine the Industry's size, structure, conduct and performance, as well as its ownership.

For example, Government determines entry and exit; it uses its contractual powers to determine industry structure (e.g. mergers of 1958-60); it determines the form of competition for military contracts; it determines profits on non-competitive contracts and it controls military exports. As a result, Government itself is a source of market failure in the sector and such failure is reinforced by the public goods characteristics of defence.

In addition to failures in aircraft markets, there are potential failures in space markets. Space is a common property resource lacking any private markets with property rights leading to over-exploitation of space as a common property. Also, access to space is costly and such costs form a barrier to entry.

The role of Government in aerospace markets suggests that these are political markets which might also be analysed using public choice models. Such models identify various agents in political markets, comprising Governments seeking re-election, relevant bureaucracies as budget maximisers and producer groups as rent-

seekers. Public choice analysis suggests that Governments can also fail (Tisdell and Hartley, 2008, chp 14).

Government is also highly influential in civil aerospace markets. It controls and regulates property rights determining landing and over-flying rights for UK airspace. Previously, it provided targeted financial assistance and support through its Civil Aircraft Research and Technology Demonstration programme (CARAD) as well as repayable launch investment (previously known as launch aid: HCP 151-1, 2005). In 2007, CARAD was replaced by Collaborative R&D support which is general and not specific to the Aerospace sector.

Collaborative R&D support is part of a range of policies administered by the Technology Strategy Board which is a non-departmental public body established by the Government in 2007 and sponsored by the Department of Business, Innovation and Skills with the aim of promoting innovation through a variety of programmes and delivery mechanisms.

In relation to state assistance, the UK is not unique and foreign Governments are centrally involved in creating and supporting their national aerospace industries. Examples include the Governments of Japan and South Korea which are actively creating national aerospace industries; Brazil and Canada which have benefited from state support in creating an internationally-competitive regional civil aircraft industry; EU nations such as France, Germany, Italy and Spain; and the USA, where Governments have supported their national aerospace industries.

State support has included direct subsidies, preferential purchasing and indirect support through regional assistance for new plant location. Inevitably, such state support for foreign aerospace industries raises the policy issue of whether similar support should be available for the UK Aerospace Industry (the argument that foreign nations are subsidising their industry so to be competitive, the UK needs to provide similar support).

Launch Investment

One phenomenon which is distinctive to the aerospace sector is the prevalence of Launch Investment. Questions arise about the economic case for launch investment and whether such state support reflects genuine capital market failures. The economics of new large civil aircraft and engine projects involve high development costs, long development periods, substantial technical and commercial risks and long-term returns.

Compared with the motor car and pharmaceutical industries, large civil aircraft and engine projects are relatively few and each represents a large proportion of the enterprise value of the firms involved in such projects (e.g. Airbus; Boeing; Rolls-Royce). It appears that aerospace industries encounter difficulties in attracting finance in the early development stage of new projects; but difficulties in accessing private funds or in such funds only being available at 'too high' a price are not necessarily evidence of capital market failures.

These features might reflect the efficient operation of capital markets and the market's judgement that there are more profitable alternative uses of such funds. Also, the fact that UK launch investment is, in principle, repayable, inevitably raises the issue of why then cannot such funds be provided by private capital markets?

There are, however, a range of possible additional factors which might explain capital market failures to finance large civil aircraft projects. Questions remain, though, as to which, if any, of these additional factors represent a genuine market failure which is specific to civil aerospace projects.

The more common additional arguments put forward in relation to launch investment include;

- Uncertainty, short-termism and risk aversion of private investors
- Long-term nature of aircraft programmes means private investors will put their money into projects with shorter pay back periods.
- Asymmetric information and the small number of programmes
- The dependence upon single companies
- The availability of state support for civil aircraft in Europe, North America, Japan and elsewhere
- The existence of significant beneficial externalities in the form of technology spin-offs from civil aircraft programmes

THE STRUCTURE OF THE UK AEROSPACE INDUSTRY

The UK Aerospace Industry is dominated by domestic monopolies for the supply of aircraft, helicopters, missiles and engines (BAE; AgustaWestland; MBDA; Rolls-Royce). Nonetheless, the domestic monopolies are in principle, contestable markets, assuming that the UK Government is willing to allow foreign competition for UK defence contracts (Laguerrre, 2009).

However, the Defence Industrial Strategy (DIS, 2005) identified key UK defence industrial capabilities which were to be protected, including BAE's design capability for combat aircraft, AgustaWestland's helicopter design capability and Rolls-Royce engine capability. Other capabilities were to be open to foreign competition (e.g. trainer aircraft; large transport aircraft; future helicopter requirements).

Overall, the UK military aircraft sector is generally believed to be 'too large' and the "current size of the air sector is not sustainable, and rationalisation and reduction in terms of both infrastructure and employment is inevitable" (DIS, 2005, p89).

In terms of ownership structure, significant parts of the UK aerospace industry are foreign-owned. For example;

- AgustaWestland is owned by Finmeccanica (Italy)
- MBDA is jointly-owned by BAE, EADS (France) and Finmeccanica (Italy)

- Shorts (Belfast) is owned by the Canadian company Bombardier
- Smiths Aerospace was acquired by General Electric (USA) in 2007
- Shorts Missiles Systems was acquired by Thales (France)
- Airbus (UK) was acquired by EADS
- Messier-Dowty is owned by Safran (France)
- TRW (Lucas Aerospace) is owned by Goodrich (USA)

Similarly, the major UK aerospace firms, namely, BAE and Rolls-Royce, have substantial ownership of foreign aerospace and defence companies:

BAE has a major presence in the US defence market, mostly in the ownership of US land systems and defence electronics subsidiaries; in Australia and Saudi Arabia; and it has a 20.5 per cent shareholding in the Saab group of Sweden. BAE is also involved in European collaborative projects, including the Typhoon combat aircraft and MBDA missiles as well as being a partner company on the US Lockheed Martin F-35 combat aircraft (JSF).¹⁹⁴

Rolls-Royce owns Allison the US engine company and is involved in various European collaborative military aero-engine projects (e.g. Typhoon; A400M airlifter) as well as the US F-35 programme (including the alternative JSF engine with General Electric).

The UK's top 6 aerospace firms in 2009 are shown in Table 6.3 (UK-owned firms only). In terms of sales and employment, BAE Systems dominates the UK Aerospace Industry (and the UK Defence Industry) and is considerably larger than its nearest rival. There are also considerable differences in profitability and productivity amongst the firms shown in Table 6.3, and BAE was not the top firm for all three performance indicators.

Table 6.3: Top 6 UK Aerospace Firms

Company	Sales (\$m)	Employment	Profits on sales (%)	Return on capital (%)	Productivity (sales per employee) (\$)
BAE Systems	30,928	94,000	12.0	13.5	329,018
Rolls-Royce	11,363	38,900	9.4	12.8	433,130
Cobham	2,755	13,036	8.8	10.6	208,701
Meggitt	2,156	8143	14.8	5.5	264,733
BBA Group	2,145	10,613	9.1	8.2	202,072
GKN	1,859	40,000	4.4	7.6	214,134

Note: UK-owned only firms shown. Data not available on UK sales, etc, for UK divisions of foreign-owned UK-based firms (e.g. AgustaWestland; Smiths Aerospace).

Source: Flight (2009a).

¹⁹⁴ BAE is also involved in independent development work on UAVs (e.g. Taranis).

Table 6.4: Employment in the UK Aerospace Industry, 1918-2008

Year	Employment (numbers)
1918	112,000
1924	11,735
1930	21,322
1934	23,775
1938	128,000
1940	750,000
1944	1,700,000
1948	171,800
1950	179,465
1957	311,936
1960	291,335
1965	259,025
1970	235,000
1980	241,997
1990	195,396
2000	150,651
2008	100,740

Notes:

i) Data from different sources so they are not necessarily based on comparable definitions of the Industry and of employment.

ii) Data for 1980-2008 based on direct employment only (excluding indirects which are typically some 1.3 times direct numbers for 2000-2008).

Sources: Hayward (1989); Plowden (1965); SBAC (2000;2009).

Using employment as an indicator of Industry size, Table 6.4 above shows the impact of war and peace on the size of the UK Aerospace Industry. Since the end of the Cold War in 1990, the Industry's employment has almost halved from.

REGIONAL DISTRIBUTION OF THE UK AEROSPACE INDUSTRY

The Industry has regional concentrations associated with its major firms. There are major aerospace concentrations in the South-East (including London), the South-West (Bristol; Yeovil), the North-West (BAE located in the Preston area) and the Midlands (Rolls-Royce, Derby). Elsewhere, there are local concentrations in East Yorkshire (BAE, Brough); Scotland (Edinburgh) and Northern Ireland (Belfast). The Industry's wide geographical dispersion partly reflects Government wartime location and post-war decisions (see Section II).

The major regional concentrations attract clusters of high technology centres and small firms (SMEs) supplying first tier suppliers and prime contractors. Some of these SMEs have established 'niche markets' and are 'centres of excellence' in specialised areas of manufacturing. Interestingly, SMEs seem to be relatively under-represented in military markets.

In 2007-08, the UK Industry's total sales were divided almost equally between military and civil markets; but SMEs accounted for 35 per cent of military sales compared with 65 per cent of civil sales (SBAC, 2009). Such differences in market shares might reflect problems of access for SMEs seeking to enter military markets (and hence a possible market failure).

6.4 A Brief History of the Aerospace Industry

THE EARLY PIONEERS AND WORLD WAR I (1903-1918)

The early pioneers of manned flight were mostly privately-financed inventors using patents and prizes from competitions to capture any return on their investments. The Wright brothers made the first manned and powered flight in December 1903 when they flew 120 feet in 12 seconds. The first British manned powered flight was made in 1908 (Brabazon).

Early British pioneers included Farman, Dunne, de Havilland, A.V. Roe, Handley Page, the Short Brothers and Thomas Sopwith. Even at this early stage, some inventors were sponsored by the British military. By 1912, the state-owned Royal Aircraft Factory had been created and became involved in the early British aircraft design and production for the Royal Flying Corps.

The First World War led to a major increase in demand for both quantity and quality of aircraft for military roles. Fighter aircraft speeds increased from around 60mph in 1914 to over 120mph in 1918. The UK Industry expanded rapidly with ever-increasing demands for speed and power which resulted in major technical advances (e.g. aircraft construction techniques; materials; aircraft design; engines: Angelucci, 1981).

THE INTER-WAR PERIOD: CIVIL AIRCRAFT AS AN INFANT INDUSTRY (1918-34)

By 1918, the UK Aircraft Industry was the largest and one of the most technically capable in the world, with 122 firms employing 112,000 personnel (Hayward, 1989, p11). However peace resulted in cancellations of military orders and little prospect of any new significant military orders (there were large stocks of surplus aircraft). This led to exits from the Industry (e.g. Airco; Sopwith who later joined with Hawker to create Hawker Engineering) and efforts to diversify (e.g. into motor vehicles, metal working and even turning hangars into pig-rearing and mushroom-growing: Hayward, 1989, p12).

Eventually, the Government introduced measures to support both military and civil aircraft developments. The Air Ministry provided sufficient work to support major design teams by allocating contracts to selected firms known as the 'family' or 'the ring' with the aim of promoting competition in design. To increase their prospects of survival, firms tended to specialise in specific product areas such as fighters (e.g. Bristol; Gloster; Hawker), flying boats (e.g. Blackburn; Shorts; Supermarine) and bombers (e.g. Fairey).

The 'family' system was criticised for its 'featherbedding' of the Industry; for its continued support of existing firms rather than promoting rationalisation to create larger firms able to compete with the US rivals; for its failure to promote mass production; and for the Air Ministry's conservatism in design requirements (e.g. Empire policing in the 1920s did not require high speed aircraft). Instead, innovation was promoted by air races (Schneider Trophy) and the pursuit of world records as well as by imaginative designers willing to launch advanced types of aircraft mostly as private ventures (Hurricane; Spitfire; Wellington).¹⁹⁵

Civil aircraft was an infant industry in the 1920s and early 1930s but during this period civil aviation became the determining factor in the development of the aeroplane (Angelucci, 1981, p109). UK Government support for civil aircraft development involved subsidising the new Imperial Airways which was required to use British aircraft; but it was tasked with developing air routes to the Empire which represented a UK-specific requirement. In contrast, the growing demand for air travel in the USA with its large domestic market supported a number of rival firms and airlines with manufacturers achieving profitability levels which encouraged investment in large-scale production.

REARMAMENT AND WORLD WAR II (1934-45)

Rearmament resulted in increased military demands for both quantity and quality leading to further innovation in military aviation (e.g. monoplanes; closed cockpits; retracting undercarriages) and increases in speed. Additional capacity was financed by the state, with expansion achieved through a combination of;

- Capacity increases by existing firms in 'the family'
- Including second tier firms in 'the family'
- Contracting-out aircraft and engine production to other suitable manufacturing firms, mainly in the motor industry
- The shadow factory scheme (e.g. managed by Nuffield)

Nonetheless, the Industry and the Air Ministry had much to learn about large-scale production. War demands for volume production exposed the limitations of the UK Aircraft Industry with its tradition of small-scale production based on a chief designer with no experience of 'designing for production.' In contrast, by the end of the War, US firms resembled the major car plants with moving production lines and larger research, design and development organisations (Barnett, 1986).

World War II led to the development of the jet engine as its single most important innovation affecting both military and civil aviation. The Gloster Meteor jet fighter flew in 1943, powered by the Whittle jet which was later developed by Rolls-Royce into the Derwent series (Hayward, 1989, p35). The War also destroyed Britain's European rivals in aircraft markets.

¹⁹⁵ Some Industry rationalisation occurred in the inter-war years. In 1935, Hawker acquired Armstrong Siddeley, A.V. Roe and Gloster to form the Hawker Siddeley Group. Vickers bought Supermarine (1928) and de Havilland was closely associated with Airspeed which it bought in 1940. Few UK airframe firms were vertically-integrated with an aero-engine division (e.g. Bristol; de Havilland).

During the War, the UK concentrated on the production of fighters and bombers and relied on the USA for the supply of military transports: a decision which gave the US aircraft industry a competitive advantage in civil airliners at the end of the War. However, by 1942, the UK was considering the task of re-creating its civil aircraft industry. To this end the Brabazon Committee recommended various projects, including bomber conversions.

POST WAR ADJUSTMENT AND THE KOREAN WAR (1945-57)

The end of the War led to the inevitable reduction in demand for military aircraft. But, unlike 1918, the emergence of the jet engine created demands for new generations of jet-powered combat aircraft (Gloster Meteors; de Havilland Vampires), with plans to equip the RAF with supersonic jet fighters and jet bombers by the mid-1950s (Swift; Hunter; Canberra; V-bombers).¹⁹⁶

The Brabazon committee's recommendations provided the Industry with funding for a civil aircraft programme to assist the adjustment from war to peace. Firms were also retained through the award of development contracts, some of which were duplicate projects to provide 'insurance' against project failures.¹⁹⁷ However the programme was costly and had few commercial successes (e.g. Vickers Viscount; de Havilland Dove; Barnett, 1995, chp12).¹⁹⁸

The technical failure of the Comet confronted de Havilland with possible bankruptcy. The company was rescued by the Government through cash assistance and an RAF order for modified Comets as military transports. The nationalised airlines also continued to be required to 'buy British'. In 1951, the new Conservative Government believed that aircraft firms should fund the development of new civil aircraft as private ventures (private venture policy).

The Korean War led to re-armament and increased demands for modern jet aircraft (some of which were ordered off the drawing board: e.g. Swift, which proved to be a failure). Again, problems emerged with delays in major projects, difficulties in achieving volume production, inefficiencies due to cost-plus contracting and firms being too small compared with their US rivals (Hayward, 1989, p63). The UK Industry was now dominated by six firms, namely, Bristol, de Havilland, English Electric, Hawker Siddeley, Rolls-Royce and Vickers.

THE ONSET OF THE COLD WAR AND INDUSTRY MERGERS (1957-60)

The 1957 Defence White Paper (Sandys White Paper) reflected the Cold War and signalled major changes in the Industry. Aircraft were becoming technically more

¹⁹⁶ The 'ten year rule' required that for planning purposes the armed forces should not plan on fighting another major war for ten years.

¹⁹⁷ In 1945, there were 27 airframe and 8 engine firms, with these divided into first and second divisions. There remained too many relatively small firms compared with the US industry.

¹⁹⁸ Project recommendations included a long-range piston-engined trans-Atlantic airliner (Bristol Brabazon); a short-range piston-engined airliner (Airspeed Ambassador); a short-range turbo-prop airliner (Vickers Viscount); a jet-powered mail carrier (to become the de Havilland Comet); and the Princess flying boat was added to the programme in 1946 (Hayward, 1983;1989).

complex, taking longer to develop and becoming costlier, leading to fewer being bought so making it more difficult to achieve volume production in small domestic markets.¹⁹⁹

The Ministry of Supply recognised the need for Industry rationalisation and the creation of larger firms and an end to the Buggins Turn of sharing development contracts between firms. Re-structuring was to be achieved by the selective allocation of contracts according to the following principles:²⁰⁰

- An ideal aircraft firm was one engaged in both military and civil aircraft and in industrial non-aircraft activities so that it could raise its capital on the basis of its entire diversified structure
- Contracts would not be placed with the winner of a design competition but with a firm which had the technical ability to move quickly from development to production and with the financial strength to support the project when difficulties occurred. Candidates for 'relegation' were identified (e.g. Gloster; Vickers Supermarine)

Re-structuring was achieved in two stages. The first stage involved close associations and the speedy formation of consortia. Two contracts were used to achieve the desired re-structuring comprising a civil aircraft and military aircraft contract. The first contract for a BEA jet airliner (Trident) was awarded to a de Havilland led consortium with Fairey and Hunting, known as Airco. The second contract for a new strike aircraft (TSR-2) was awarded to a new joint company of Vickers and English Electric. There was also a merger in the engine sector between the Bristol and Hawker Siddeley engine groups to create Bristol Siddeley Engines.

The second phase of the re-structuring occurred between 1959 and 1960, when the Government indicated that it wished to form a minimum number of competing groups in airframes and engines. There was an additional incentive from the financial problems being encountered by the private venture funding of civil aircraft.

The outcome was the creation of five major groups, namely:²⁰¹

- The British Aircraft Corporation (Bristol Aircraft; Vickers; English Electric; Hunting)
- The Hawker Siddeley Group (including Blackburn, de Havilland and Folland)
- Bristol Siddeley Engines and Rolls-Royce as engine groups
- Westland as a domestic monopoly for helicopters (including Bristol Helicopters; Fairey; and Saunders Roe)

199 It was announced that nuclear weapons would replace conventional forces and that guided weapons would provide point defence of UK bases. The Ministry of Defence considered the abolition of RAF Fighter Command, but the proposal was rejected (Peden, 2007, p286). Instead some advanced aircraft projects were cancelled and there was to be one more manned combat aircraft (signalling the end of manned combat aircraft; but even in 2009, the UK plans to buy F-35 combat aircraft!).

200 Hartley, 1965, pp848-9.

201 Three firms remained outside the groups, namely, Handley Page, Scottish Aviation and Shorts (69 per cent state-owned). The re-structuring reduced the Industry from 14 major airframe and 5 engine firms in 1958 to 5 major groups in 1960.

The formation of the five groups was accompanied by a Government announcement that except for specialised requirements of public policy, the Government intended to concentrate its orders on the five major groups (Hartley, 1965, p848). It was also announced that the Government would provide increased state support for promising civil aircraft and engine projects (launch aid: Hayward, 1989; 2009).²⁰²

Unfortunately, maintaining competition in the airframe and engine sectors (duopolies) did not avoid the continued task of ensuring that Government orders were shared between each of the rivals (Buggins Turn). The alternative (which was accepted for helicopters) would have been the formation of larger domestic monopolies in each sector.

PLOWDEN, ELSTUB AND INTERNATIONAL COLLABORATION (1960-70)

Despite the rationalisation of the industry in the 1950's there were continued criticisms of the industry, in particular with regard to;

- It was too large and uncompetitive and had been 'featherbedded' for too long
- It absorbed an undue proportion of the nation's scarce R&D resources
- It was relatively unsuccessful in world markets (e.g. compared with the French Industry: Hartley, 1996)
- The discovery of excessive profits earned by Ferranti on the Bloodhound missile (1964) and continued cost increases and delays on the TSR-2 project

The newly-elected Labour Government of 1964 made two initiatives affecting the Industry. First, it established a Committee of Inquiry into the future of the Industry (Plowden, 1965). Second, it cancelled three major UK military aircraft projects, namely, TSR-2, P1154 and HS681.²⁰³ The cancelled projects were replaced by purchases of US aircraft (Phantom with UK engines and some UK equipment; Hercules transport) and Hawker Siddeley was partly compensated with a limited development programme for its P1127.²⁰⁴

The Plowden Report (1965) considered the case for a national aircraft industry and concluded that none of the arguments provided conclusive evidence for maintaining an aircraft industry. The Report expressed doubts about the nominal competition in the UK market and recommended that:

- Mergers between each of the groups would offer economies and end the need to allocate work between each of the groups
- The level of support for the industry should be reduced to a level of similar to that given to comparable British industries
- Britain should collaborate with other European countries
- Costly projects should be purchased from the USA (with possible licensed production of US designs)

202 Also, state support was provided by RAF orders for military versions of civil aircraft (VC-10; Argosy; HS748).

203 A number of new projects were announced in the early 1960s. These included military requirements for a new supersonic VTOL strike fighter (P1154) and a VTOL transport aircraft (HS681), both contracts being awarded to Hawker Siddeley.

204 Later to become the Harrier Jumpjet.

In 1966, Rolls-Royce acquired Bristol Siddeley Engines creating a domestic monopoly in engines and reducing the major groups from five to four. Also, in 1966, Government was involved in discussions about a merger between the airframe groups with a possible state share; but no agreement was reached.

During this period a number of international collaborative programmes were pursued, including:

- Development of a supersonic airliner (Concorde) with BAC and Sud Aviation as joint designers
- Jaguar strike aircraft (airframe development led by Breguet: 1965)
- A helicopter package (1967) and a missile package (Martel)
- Multi-role combat aircraft (AFVG, with BAC leading Dassault)
- A civil aircraft initiative involving Britain, France and Germany for the development of an Airbus with Hawker Siddeley as the UK airframe firm in this joint programme

However, these agreements were not always successful. In 1967 France withdrew from the AFVG aircraft and the UK later agreed a new three nation collaborative arrangement for the multi-role combat aircraft (Tornado with Germany and Italy in 1968). In 1969, France and Germany agreed to continue the Airbus without the UK; but Hawker Siddeley decided to remain in the programme on a private contract basis (An example of where the UK Government failed to support Airbus in its early stages, but the private sector took a different view)

In 1968, a new Profit Formula was introduced for non-competitive Government contracts, and the productivity of the UK Industry was reviewed in the 1969 Elstub Report. This Report found a productivity gap between the British and American aircraft industries, mainly due to the small scale of airframe production in Europe. (Elstub, 1969, paras 186-192), noting that:

- After adjustment for output differences, the ratio of productivity in the USA and Britain was estimated to be between 1.2 and 1.5 to 1
- Quantity and learning economies were the major reason for this productivity gap
- The disadvantages of collaboration, reflected in the time needed to reach decisions at Government level and in the role of national interests in agreeing inefficient work-sharing arrangements

NATIONALISATION, PRIVATISATION AND RESTRUCTURING (1970-90)

Rolls-Royce was declared bankrupt in early 1971 and was immediately nationalised.²⁰⁵ Next, in 1977 the Labour Government nationalised the airframe firms and merged them to form British Aerospace (BAe). The case for nationalisation being

²⁰⁵ Rising development costs and technical problems on the Rolls-Royce fixed price contract to supply the RB211 engine to Lockheed was the immediate cause of the bankruptcy (the new company was Rolls-Royce (1971) Ltd: Hayward, 1989, pp133-140).

based on the Industry's dependence on the state, including civil aerospace projects (Hartley, 1996, p224). Shorts was already nationalised and its position remained unchanged outside the new group.

By contrast Westland remained in private ownership, although between 1986 and 2004 its ownership varied from the USA (Sikorsky) to GKN (UK) and finally to Italy (Finmeccanica): thus foreign ownership of a UK helicopter company which was part of the UK's defence industrial base was accepted by the UK Government.²⁰⁶

Two civil aircraft decisions dominated the nationalisation period. First, BAe was faced with a choice between being a sub-contractor on the Boeing 757 airliner or joining the European Airbus consortium as a full partner: it chose to join Airbus. Second, the Government approved the re-launch of the HS146 regional jet airliner.

The policy of nationalisation was reversed in 1979 by the new Conservative Government which was committed to privatisation (Parker, 2009). As a result BAe was completely privatised by 1985, Rolls-Royce was privatised by 1987 and Shorts by 1989 (Shorts was purchased by Bombardier, the Canadian regional airliner firm).

Following privatisation, BAe adopted a new business model focused on diversification. It entered the land systems defence business when it acquired the ammunition and small arms section of the Royal Ordnance Factories (1987); it bought a construction company (Ballast Needham) and the Rover motor car company (1988: compare Saab with aircraft and car divisions).

In the 1980s, BAe and the UK aircraft industry were involved in a range of military aerospace programmes, including;

- UK military aircraft programmes (Hawk; Harrier)
- 3-nation collaborative Tornado (including exports to Saudi Arabia)
- Development of the new 4-nation Eurofighter Typhoon combat aircraft (Germany, Italy, Spain, UK)

BAe was also involved in various civil aviation programmes including Business jets (BAe 125), Feeder airliners (Jetstream) and Regional jets (BAe 146), an advanced turbo-prop airliner (ATP) and specialist wing work for Airbus aircraft. However BAe incurred losses on its civil aircraft programmes.

END OF THE COLD WAR AND THE DEFENCE INDUSTRIAL STRATEGY (1990-2009)

Following the end of the Cold War, the search for a peace dividend resulted in cuts in defence spending leading to job losses and plant closures. The US defence industry underwent major restructuring leading to the formation of four large aerospace and defence firms able to achieve economies of scale and scope so increasing their international competitiveness (Boeing; Lockheed Martin; Northrop Grumman; Raytheon: SIPRI, 1999).

²⁰⁶ The US helicopter firm Sikorsky acquired a share in Westland in 1986; later in 1988, GKN acquired a stake in Westland; then in 2001, there was a merger between Agusta and Westland and in 2004, the Italian company Finmeccanica acquired Westland.

In comparison, there were still too many relatively small European aerospace and defence firms. European Governments preferred a European merger of their defence firms to form a single European Aerospace and Defence Company (EADC: in fact a merger was agreed between BAe and DASA in 1998).

BAe responded by acquiring Marconi Electronics Systems, the defence subsidiary of GEC (including its warship yards: 1999). This merger resulted in a vertically-integrated company with warship building activities known as BAE Systems. DASA responded by creating the European Aeronautic Defence and Space Company (EADS) which was a horizontal merger with Aerospatiale (Spain's CASA joined EADS later). BAE has focused on its core defence business by divesting all its non-defence activities, including:

- It ended its production of loss-making civil aircraft and sold its business jets division (to Raytheon) and its Airbus wing work (Airbus (UK) to EADS).
- It sold its Rover Group motor car business to BMW
- Its space division was sold to Astrium (EADS)
- Its share of SELEX Sensors and Airborne Systems was sold to Finmeccanica
- It acquired Alvis Vickers, the UK's main manufacturer of armoured fighting vehicles (Challenger tanks; Warrior)

BAE made further acquisitions in the US defence market by acquiring American land systems firms (United Defense Industries-UDI and Armor Holdings). Defence firms were acquired in Australia (Tenix Defence) making BAE the largest defence contractor in Australia.

These changes mean that the UK is no longer involved in the domestic development and production of civil aircraft marking the end of the post-1945 policy of re-entering this sector of the aircraft industry. Instead, the UK has created a world class centre of excellence for wing design, development and production for the collaborative Airbus family of civil jet airliners (with plants at Broughton and Bristol).

In this sector, international collaboration has been successful with Airbus sharing the world's large civil jet airliner market with Boeing. However, UK specialisation on wing work has involved state assistance in the form of repayable launch investment (a financial support mechanism which the US alleges has provided illegal subsidies to Airbus and in 2009 was being reviewed by WTO) and wholly private venture funding of major civil aircraft and component wing work has not been achieved.

Up to 2005, BAE was encountering major problems with project management (Nimrod; Astute submarines) and the adverse financial implications of fixed price contracts for some of its major UK defence programmes. Partly in response to this in 2005, the UK Government published its new Defence Industrial Strategy (DIS, 2005). The DIS identified the key defence industrial capabilities which MoD aimed to retain in the UK and it expected major reductions in the future demand for military aircraft, in particular;

Fixed Wing Aircraft

For fixed wing aircraft, the DIS does not envisage the UK designing and producing a new generation of fixed wing manned combat aircraft after the Typhoon and the Joint Combat Aircraft: hence, there will be a significant reduction in new military aircraft design and development work. But, BAE will be involved in the life-cycle support of both these aircraft, together with Rolls-Royce, Smiths Aerospace and Selex Sensors and Airborne Systems.

Large Aircraft and Training Aircraft

No sovereign requirement is envisaged for sustaining a domestic industrial capability in large aircraft and training aircraft. The expected decline in new programme work raises doubts over the future of some of BAE's four production sites (Brough in East Yorkshire; Samlesbury and Warton in Lancashire; Woodford in Cheshire). In 2009, BAE announced the closure of its Woodford plant by 2012 (with the end of Nimrod production).

Helicopters

With helicopters, the DIS planned to retain in the UK the skills necessary for through life support of UK designed helicopters, namely, AgustaWestland. However, the DIS stated that the UK "...will continue to look to the vibrant and competitive global market place for its future helicopter requirements with AgustaWestland's role neither predefined nor guaranteed..." (DIS, 2005, p94).²⁰⁷

Missiles

For missiles, the DIS identified excess capacity in the UK and Europe and it expected major reductions in demand leading to substantial job losses with opportunities for industrial rationalisation and consolidation (DIS, 2005, p104; HCP 824, 2006, p18).

In addition to the future changes in military demands outlined in the DIS, the Industry faces three further challenges:

- First, there are challenges from new entrants in the form of overseas emerging competitors (HCP151-1, 2005)
- Second, the WTO investigation of repayable launch investment and subsidies to the European and US aerospace industries means uncertainty surrounds the future of state financial assistance to the UK civil aerospace Industry (and to the European and US industries: HCP, 151, 2005, p30)
- Third, in the defence sector, there are potential conflicts between the DIS and developments in Europe in the form of the creation of a European Defence Equipment Market (EDEM or Single Market for defence equipment) and the development of a European Defence Technology and Industrial Base (EDTIB – e.g. DIS identifies key industrial capabilities which will be retained in the UK)

²⁰⁷ The future of the DIS remains in doubt until after the expected 2010 Defence Review. The policy is not costless (Hartley, 2006).

6.5 The Impact of Government

Governments have had major impacts on the development of the UK Aerospace Industry; they are central to understanding military markets and have played a major role in civil aerospace markets. In military markets, Governments dominate domestic demand, they determine collaborative defence projects and they also influence overseas demand through their project choices and willingness to allow export sales to specific countries. By specifying performance requirements, military demands determine technical progress (e.g. speed; range; capability, etc). Government military demands are reflected in the award and allocation of contracts.

COMPETITIVE AND NON-COMPETITIVE CONTRACTS IN DEFENCE PROCUREMENT

Fixed price competitive contracts were typical of MoD procurement before the DIS (2005). In principle, such contracts place the contractor at risk but unexpected cost overruns can create financial penalties for the contractor with the possibility of bankruptcy (e.g. BAE's Nimrod MRA4 aircraft). Opportunities also arise for contractors to thwart the original aims of the competitively-determined price (e.g. optimism bias; re-negotiation of price after the contract has been awarded).

The emergence of UK domestic monopolies in aerospace and the DIS (2005) has led to a shift away from competitive procurement to partnership agreements with preferred suppliers and non-competitive contracts (target cost incentive contracts). On non-competitive contracts, Government determines the profit rules which provided a rate of return of almost 10 per cent on costs of production in 2009 (Review Board, 2009). The Profit Formula for non-competitive contracts has been criticised for failing to provide sufficient efficiency incentives and for being 'too generous' for non-competitive work.

UK aerospace firms provide limited private funding for military aircraft work. They finance some R&D work and there are examples of the limited private funding of military aircraft (e.g. export versions of the BAE Hawk jet trainer/strike aircraft; UAVs; technology demonstrators). There are sound economic reasons why private firms will not undertake the private venture financing of advanced and complex military aircraft, including;

- They are costly projects with long time-horizons and defence-specific requirements for the UK Government: there might be no other buyers
- Firms have to create design and production teams and facilities which have limited (or no) other uses
- Governments can change or reduce or cancel their orders (e.g. original order for Nimrod MRA4 was for 21 aircraft reduced to 9 aircraft)

In these circumstances, firms will fear that they will never recover their sunk costs where such costs might be so large as to endanger the future of the company (the hold-up problem): hence, the need for Government to fund such defence-specific investments (compare, say, the motor industry where there are large numbers of buyers of cars).

The UK Government also assists UK aerospace firms with exports of military aerospace equipment (previously DESO and now the UKTI Defence and Security Organisation). An economic evaluation of the costs and benefits of UK defence exports concluded that:

“... first, the economic effects of the reduction in defence exports are relatively small and largely one-off, and secondly, that the balance of arguments about UK defence exports should be determined mainly by non-economic factors” (Chalmers, Davies, Hartley and Wilkinson, 2002, p343)

However, this analysis was for aggregate defence exports and not for UK exports of military aerospace equipment (although military aerospace exports form the majority of UK defence exports).

LAUNCH INVESTMENT IN CIVIL AVIATION

Governments have also influenced the development of the UK civil aerospace industry. Historically, they did so through the 'buy British' policy of the nationalised airlines and by state financial support to UK civil aircraft and engine projects (e.g. the post-1945 Brabazon programme: see Section II above). More recently, state financial support has been through launch aid (or repayable launch investment: HCP 151-1, 2005) as efforts at introducing wholly private venture finance for the development of large civil aircraft and engine projects were not successful.²⁰⁸ Launch investment provides pre-launch risk-sharing finance for new large civil aircraft and engine projects where such funding represents a minority share of total development costs.

A 2006 Report concluded that “...the market has failed to provide finance to the UK civil aircraft industry but it was not possible to conclude that this reflected a capital market failure as viewed by economists” (AIGT, 2006, p16). There is, however, Government failure reflected in an extensive system of international support for civil aircraft development, especially in the USA, Europe, Japan and more recently in China. The consensus view is that “There is a very large imbalance in the absolute levels of support provided by other Governments, particularly in the US, in comparison to the UK, and a material imbalance with the rest of Europe”(AIGT, 2006, p16).

A comparison of payments and receipts on launch investment provides one possible indicator for assessing the policy.

- For 1945 to 1971 it is estimated that there was a net subsidy of over £1,300 million (1974 prices) to UK civil aerospace projects and that for this period “...the net effect of aerospace launch investment has been a loss of national welfare” (Gardner, 1975, p149)
- During 1946 to 2004, payments on launch investment were £2.63 billion against receipts of £1.7 billion showing net losses of almost £1 billion (in current prices, excluding Concorde: data from DTI)
- One sub-period, namely, 1991 to 2000 showed receipts of £1.02 billion exceeding payments of £0.35 billion by £0.67 billion (current prices without discounting)

²⁰⁸ Private venture finance has been the basis for the development of light aircraft, business aircraft and civil helicopters where the USA has the economic advantage of a large domestic market.

Admittedly, these data are only one indicator: they do not show future receipts; nor do they allow for the assessment and valuation of other objectives pursued by the policy.²⁰⁹ The position of launch investment in the UK (and the EU) is currently subject to review by the WTO so there is considerable uncertainty about its future (Flight, 2009).

The 1992 bilateral agreement between the EU and the USA limited the level of state support available to their producers of large civil aircraft (extended to include aero-engines). This agreement set an upper limit of 33 per cent on the proportion of eligible launch costs which can be supported by launch investment, with 25 per cent repaid at the cost of Government long-term borrowing and the balance of 8 per cent repaid at the cost of Government borrowing plus one percent (HCP151-1, 2005). Such direct support which was favoured by EU Governments was to be repaid over 17 years. The agreement also included indirect support which is the form of support used mainly by the USA (*indirect support is not repayable and is limited to 3 per cent of the Industry's annual sales*).

Launch investment is limited to 33 per cent of total development costs for new large civil aircraft, so that firms have to provide at least two-thirds from private sources. Private (supplier) financing is available from company funds and from suppliers providing risk capital and acting as risk sharing partners typically through Risk and Revenue Sharing Agreements or Partnerships.²¹⁰ Such Partnerships are well-established and can provide up to 30 per cent to 40 per cent of total programme costs with a further one-third from the prime contractor (AIGT, 2006, p14).

The WTO investigation of the Airbus-Boeing dispute creates considerable uncertainty over future state funding for UK and European civil aircraft and engine programmes. Without adequate private funding, any reduction in EU state support for the sector and no comparable move internationally, the UK and EU Aerospace Industry would be at risk.

In addition to launch investment, the UK Government provides further state support for civil aerospace R&D.²¹¹

- The civil aircraft R&D programme (CARAD) which is no longer available but whose evaluation concluded that “It was difficult to judge whether the benefits of CARAD were greater or smaller than alternative uses of public funds...” (BERR, 2008)
- R&D funding for National Aerospace Technology Strategy projects through the Technology Strategy Board and the Regional Development Agencies (£153 million between 2004 and 2007)
- R&D tax credits (estimated at some £60 million – £80 million per annum) which are available to all sectors but Aerospace as an R&D-intensive sector might be more likely to benefit
- Government funding of greener engine technologies

209 Such as maintenance of the UK aerospace industry as a successful sector making a net contribution to economic welfare.

210 The development of the US Boeing 787 airliner involves substantial risk sharing with partners in Japan, Italy and the USA, each covering their share of project R&D and risk in return for a share in the programme.

211 These various policy initiatives need to be assessed in terms of their contribution to correcting for major market failures. For example, when it existed, CARAD might have been regarded as a means of correcting for capital market failures and of recognising the beneficial externalities from civil aerospace R&D (technical spill-overs).

- Selective finance for investment and regional assistance (over £33 million in 2006)
- Support for overseas sales campaigns (BIS, 2009)
- Support for the Aerospace Innovation and Growth Team and implementing its agenda (AIGT, 2003)

SKILLS

The UK aerospace sector is covered by the SEMTA (Science, Engineering and Manufacturing Technologies) Sector Skills Agreement (SSA) which aims to influence the supply of relevant education and training provision and to address skill gaps and shortages. The R&D-intensive nature of the Aerospace Industry is reflected in the skill composition of its labour force, in its demands for skilled labour and in its wage/salary levels, such as:

- In 2008, some 36 per cent of all the Industry's employees held a University degree or equivalent
- The number of higher education students taking aerospace engineering degrees has been rising by some 7 per cent per year over the 10 year period 1998 to 2008
- In 2006, average salaries in UK Aerospace were £33,000 which were 43 per cent higher than the UK average wage and some 32 per cent higher than the average for manufacturing suggesting that aerospace made a net economic contribution compared with alternative uses of resources (BIS, 2009)
- Similar results were obtained for 2005 data showing that value added per employee in the UK Aerospace Industry was 35 per cent higher than for UK manufacturing and 50 per cent higher compared with the whole economy (MacKay, 2005)

6.6 The Performance of the UK Aerospace Industry

WORLD CLASS FIRMS

The UK Aerospace Industry contains some world class firms²¹² whose productivity and international competitiveness differ from that of the Industry average. The UK is also a centre of excellence for wing technology (Airbus UK), fuselage design (Bombardier – Belfast), aerostructures (GKN) and landing gear systems (Messier-Dowty). The 2005 Parliamentary Report on the UK Aerospace Industry (HCP151-1, 2005) concluded that the Industry is:²¹³

- One of the most successful sectors of UK manufacturing
- One of the UK's major export sectors. Total military and civil exports were £14.2 billion in 2008. Over the period 1997 to 2007, the UK Aerospace Industry recorded a surplus on its balance of trade (SBAC, 2009)
- R&D-intensive (Its investment in R&D was second only to pharmaceuticals)

212 Such as BAE Systems; Rolls-Royce; AgustaWestland; Smiths Aerospace; Martin Baker.

213 The data in the 2005 Report have been up-dated to 2008.

- A major employer providing direct and indirect employment in the UK of some 224,230 people in 2008²¹⁴
- A technology-intensive industry which generates ‘technology spill-overs’ for the wider UK economy

Launch investment made an important contribution to fostering capability in the UK civil aerospace industry; it enabled the Government to secure valuable projects which might otherwise have been located elsewhere; and UK participation in successful aircraft and engine projects allowed access to large-scale production with associated productivity improvements (AIGT, 2006, p10).

INTERNATIONAL COMPETITIVENESS

There is an absence of recently-published studies assessing the Industry’s performance, although an economic study of UK Aerospace Competitiveness concluded that over the period 1980 to 2000, the UK Industry improved its international competitiveness relative to the USA. Competitiveness was measured by labour productivity, scales of output, development time-scales, responsiveness of employment to changes in output and export performance (Hartley and Braddon, 2002, p15; Braddon and Hartley, 2007). The Industry’s export performance reflects its international competitiveness and suggests that the UK has a comparative advantage in Aerospace, which can also be seen in:

- The UK Industry exported almost 70 per cent of its output in 2008
- It has substantial military aircraft export sales (especially to Saudi Arabia) and successful export sales of the national Hawk trainer aircraft
- Major role as a supplier of wings, engines and equipment to Airbus and as a supplier of engines to Airbus, Boeing and other airlines
- Partnership on the airframe and engine work for the US Joint Strike Fighter
- It has penetrated the US military market for aerospace sub-systems (e.g. avionics; ejector seats: Hartley and Braddon, 2002; MacKay, 2005)
- The space sector of the Industry has established an international reputation in satellite communication systems

RELATIVE FIRM SIZE

An alternative approach to assessing the competitiveness of UK firms is to examine their sales relative to their European and US rivals. The data for 2008 are presented in Table 6.5 where the world’s top 15 aerospace firms by sales are shown. US aerospace firms dominate the list, accounting for 9 of the top 15. Also, the average size of the top 3 US firms is some 1.5 times the size of BAE: the US firms are achieving economies of scale, learning and scope.

²¹⁴ Alternative estimates suggest higher employment numbers at some 340,000 direct and indirect jobs in 2008: based on employment multipliers from AIGT, 2003, p30). In 2007, the UK Aerospace Industry was ranked first or second in the EU in terms of direct employment (depending on whether the Industry is defined as Aeronautics (i.e. aircraft with UK as first) or as Aerospace (aircraft and space with UK as second)).

Table 6.5: Size of Firms, 2008

Firm	Sales (\$millions)
EADS	63,308
Boeing	60,909
Lockheed Martin	42,731
Northrop Grumman	33,887
BAE Systems	30,928
General Dynamics	29,300
United Technologies (Pratt & Whitney: engines)	24,540
Raytheon	23,174
Finmeccanica	23,030
Thales	18,532
General Electric (engines)	16,189
SAFRAN (engines)	15,079
L-3 Communications	14,901
Honeywell	12,650
Rolls-Royce (engines)	11,363

Source: *Flight* (2009a).

Similarly, the average size of the top two US engine firms is some 1.8 times larger than Rolls-Royce. The larger size of the major US aerospace firms contributes to their international competitiveness and places the UK firms (and most European aerospace firms) at a competitive disadvantage. However the USA has the advantage of a large protected domestic defence market.

FIRM PERFORMANCE

Data are available on various performance indicators for UK, European and US aerospace firms. These are shown in Table 6.6. Other UK industries are shown for comparative purposes and as examples of the alternative-use value of resources: these are an illustrative rather than comprehensive analysis.²¹⁵

²¹⁵ They show only cross-section data for 2007/08 whereas a more comprehensive analysis requires time-series data for at least 20 years. For the UK companies, data are based on total sales for global activities. Also, some of the performance data are based on the available published data.

Table 6.6: Comparative Firm Performance, 2008

Company/sector	Labour productivity (£000s per employee)	Value added productivity (£000s per employee)	R&D per employee (£000s)	Profits (% of sales)
Aerospace and Defence: UK	165.3	60.5	6.7	6.4
BAE	172.4	66.6	2.1	7.6
Rolls-Royce	192.6	72.9	11.8	6.9
Cobham	118.0	58.6	6.1	15.5
Aerospace and Defence: EU				
EADS	246.7	66.0	17.0	--0.3
Finmeccanica	149.1	60.5	24.5	8.5
SAFRAN	160.8	45.9	12.4	0.5
Thales	147.6	64.5	7.0	5.9
Dassault Aviation	247.2	83.2	16.0	11.7
SAAB	134.2	60.3	8.1	9.6
Aerospace and Defence: USA				
Boeing	209.4	N/A	12.1	9.5
Lockheed Martin	150.2	N/A	4.3	10.7
Northrop Grumman	131.3	N/A	2.2	9.3
Raytheon	156.3	N/A	3.5	9.8
UK Automobiles and Parts	231.6	49.4	8.7	1.9
UK Pharmaceuticals & Biotechnology	230.2	130.0	35.3	24.0
UK Oil & Gas Producers	1622.3	345.1	4.4	13.6

Notes:

i) Sectors refer to top numbers of UK (800-850 firms), European (750) and global companies (1400): see sources for details.

ii) UK Aerospace aggregate sector includes major UK defence firms.

iii) R&D data are for the cash investments which are funded by companies only. It excludes contract R&D undertaken for customers such as Governments (e.g. defence R&D contracts): see BERR (2008a).

Sources: BERR (2008a); (2008b).

BAE and Rolls-Royce achieved productivity figures greater than most of their European and US rivals and comparable sectors such as the UK motor vehicles industry (an alternative user of UK resources). BAE's low R&D per employee figure reflects its own R&D funding but excludes all Government defence R&D spending with the firm. The UK Aerospace Industry's profitability compares favourably with its European rivals; it exceeds that for UK motor vehicles; but is below that for the US Aerospace Industry and for the UK Pharmaceutical and Oil and Gas industries.²¹⁶

LABOUR PRODUCTIVITY

Table 6.7 shows data on Aerospace Productivity based on real value added per employee for 1981 to 2000. Compared with the USA, France and Germany, the UK value added per employee was some 38 per cent lower than in the USA, 26 per cent

216 The high profitability for these UK industries helps to explain their willingness to invest in costly and risky R&D, especially Pharmaceuticals: AIGT (2006).

below France and 15 per cent behind Germany. But, since 1981, UK Aerospace Industry productivity has achieved the highest productivity growth, so narrowing the productivity gap with the USA, France and Germany: even so, in 2001, a productivity gap remained.

A more recent study confirmed these productivity gaps but with a changed ranking. Compared with the UK, the US average value added was some 7 per cent higher, Germany was 22 per cent higher and France was 55 per cent higher (based on average value added per person hour for an average of 2001-2003: BERR, 2008c).

Table 6.7: Aerospace Industry Productivity, 1981-2001

Year	UK	USA	France	Germany
1981	22	69	92	48
1991	48	98	74	63
2001	64	103	87	75

*Note: Data are for real value added per employee in US\$000, 2001 prices and exchange rates.
Source: DTI (2004).*

Further productivity data are available at the project level (compared with the Industry level). Learning-by-doing leads to productivity improvements in each aircraft programme. Today's UK learning curves are radically different from those of the 1950s and 1960s which showed learning 'levelling-off' at some 100 units and reflected small-scale UK national programmes. Current UK learning curves for civil aircraft show continuous learning reflecting UK participation in collaborative programmes leading to longer production runs of each type of aircraft (e.g. wings sets for Airbus A320 family with orders exceeding 4,300 units). Also, there have been step changes showing substantial productivity improvements between different generations of aircraft (AIGT, 2006).

Over the period 1980 to 2008, UK Aerospace Industry labour productivity showed a long-run rising trend in real terms: rising from some £70,000 per worker in 1980 to £204,000 per employee in 2008 (sales per employee in 2008 prices: SBAC, 2009, p25: including a 16 per cent real increase for 2007/08). But these labour productivity data are a limited measure of productivity improvements where improvements might reflect increasing capital costs and more purchases of inputs from other firms.

TECHNOLOGY SPILL-OVERS

The UK Aerospace Industry is an R&D-intensive industry. In 2008, total R&D spending was £2 billion with 65 per cent of this total being defence R&D (of the 65 per cent, the UK Government provided 18 per cent; other Governments provided 17 per cent; others provided 9 per cent; and 23 per cent was self-financed: SBAC, 2009, p17). Such R&D also contributes technology spill-overs both within the Aerospace Industry and to other UK industries.

There is no shortage of examples which include the application of military technology to civil aerospace projects (e.g. engines; composites) and the application of

Aerospace technology to such other UK industries as marine propulsion, high speed yachts, wind turbines and Formula 1 racing cars. But attractive though these examples appear, they do not address the policy-relevant issue of their market value: how valuable are such spill-overs from the UK Aerospace Industry and what are the mechanisms by which such technology is transferred to other UK industries (e.g. staff mobility; supply chains; university technology centres: Hartley, 2006a; AIGT, 2006).

The general point remains, namely, that R&D markets are subject to market failure where they create beneficial externalities in the form of technology spill-overs. Aerospace is an R&D-intensive industry which is a likely source of such beneficial externalities. In evaluating the spillovers from Aerospace it is necessary to recognise that:

- Aerospace is a very long-term industry, where product life cycles can extend over several Governments
- Profitability is not high relative to R&D expenditure, technology risks and market risks
- Social returns are high (high spill-overs, hence beneficial externalities)
- Overall, the result is to make Aerospace both vulnerable to Government policy changes and capable of generating substantial returns to public investment

6.7 Conclusion

Aerospace is one of the UK's successful manufacturing industries. It is an R&D-intensive, high technology industry requiring highly skilled labour (comprising scientists, technologists and skilled production workers: Hartley, 2006a) and offers high wages and salaries. It is the type of industry where the UK currently has a comparative advantage. Questions then arise as to whether the Aerospace Industry can continue to be successful and what role there might be for Government? The Industry faces some major uncertainties.

- Continued success requires continued improvements in productivity, with the Industry being the major driver for such improvements
- New entrants cannot be ignored and pose future competitive threats (e.g. China; Japan; Russia; South Korea)
- The level and type of future Government funding for defence and civil aerospace R&D (e.g. for greener aircraft and engine technologies)

Government can assist the Industry by seeking to remove major market failures. Examples include the access of SMEs to UK defence markets and measures to assess the performance of the dominant monopoly firms in the UK Industry (e.g. using firm performance reviews by the Competition Commission).²¹⁷ For the future, space is a further potential growth sector. Governments need to review market failures in space markets and the extent and form of state support for the UK space sector.

²¹⁷ For SMEs there are questions about supply chain capacity. More open markets will demonstrate whether such capacity exists.

However, *current* comparative advantage in Aerospace (and other UK Industries) does not guarantee *future* comparative advantage. Typically, private competitive markets with entrepreneurs responding to uncertainty are the mechanisms for identifying future potentially profitable markets. But Aerospace markets depart from the competitive model and are dominated by Governments and small numbers of major suppliers where a strategic game theoretic approach is more realistic. Choices in such markets are likely to be influenced by agents in the military-civil aerospace-industrial-political complex.

A review of major UK civil and military aircraft projects since 1945 shows a variety of failures and successes with failures mainly amongst civil aircraft programmes. Failures included most of the Brabazon Committee's recommendations; most of the 1960s civil aircraft projects (e.g. Argosy; Britannia; Concorde; Trident; VC-10); and amongst military projects the Swift fighter and the Nimrod AEW aircraft.

Successes included the Viscount, BAC 1-11 and BAe 146 airliners and amongst military projects the Canberra, Hunter, Jaguar, Harrier, Tornado and Hawk aircraft and some helicopter projects (based on exports). The UK's involvement in wing work for the multi-national Airbus programme of airliners has also been extremely successful with Airbus as Boeing's major rival in world markets. There remains scope for assessing the role of the UK Government in these various successes and failures (compared with the Government's role and performance in other UK Industries, such as steel, motor vehicles and banking).

One view is that after some 60 years of consolidation and elements of 'good fortune', there are now two world class firms remaining in the UK. Both of these have survived periods of weak support from various UK Governments (where weak support means no support at key stages). There are lessons from the creation of these 'winners' and the wider role in regenerating UK manufacturing industry, in particular there is evidence of:

- A lack of confidence, realism and consistency in the approach to policy
- A lack of understanding about the wider impact of more advanced aerospace technologies on the rest of the UK economy
- A lack of conviction about the importance of manufacturing industry to the UK economy (compared with say, the banking sector)

Government demands are central to future military aerospace markets, including R&D funding of defence projects (e.g. UAVs). The prospects of a major UK Defence Review after the next Election means that aerospace projects and the future of the DIS might be at risk. For example, the costs of the DIS and possible cuts in UK defence spending might mean a greater preference for importing foreign equipment. The future position of the UK Aerospace Industry needs to be recognised and considered in the next Defence Review. This requires a complete economic evaluation of the costs and benefits of a UK Aerospace Industry (c.f. Plowden Report, 1965).

Governments can also negotiate more open access to foreign defence markets and agreements on reducing international support to civil aircraft programmes. Here, the

WTO review adds uncertainty to the future of UK state funding for civil aircraft and engine projects (including the UK's role in Airbus wing work). This uncertainty is added to that generated by the prospects of the next Defence Review.

There is also the European dimension to be considered. The UK is committed to European collaboration in both military and civil aircraft projects (including helicopters, missiles and space systems). The EU is also committed to creating a European Defence Equipment Market (EDEM) and a European Defence Technology and Industrial Base (EDTIB). The position of the UK Aerospace Industry in these developments is a further source of uncertainty.

Questions arise about the results of Government policy towards the UK Aerospace Industry and whether there are lessons for future industrial policy in other sectors. A comprehensive assessment would require more evaluation of the benefits and costs of the various forms of state intervention in the Aerospace Industry.

The experience of the UK Aerospace Industry is relevant to other UK Industries where Government is a major buyer and where its procurement strategy impacts on the structure, conduct and performance of the sector. Different types of procurement contracts have different efficiency properties (c.f. cost-plus and fixed price contracts). UK Aerospace experience also shows that Governments need to be aware of an Industry's characteristics when designing policies for intervention and that their decisions can have far reaching and long-term implications for the UK and, in some cases, international markets.

6.8 References

AGT (2003). **An Independent Report on the Future of the UK Aerospace Industry**, Aerospace Innovation and Growth Team, DTI, London.

AGT (2006). **Aerospace IGT: Finance Group, Final Report** (Chair: Keith Hartley), Commercial-in-Confidence, DTI, London.

ASD (2007). **Facts and Figures 2007**, Aerospace and Defence Industries Association of Europe, Brussels.

Angelucci, E (1981). **World Encyclopedia of Military Aircraft**, Jane's, London.

Braddon, D. And Hartley, K (2007). The competitiveness of the UK Aerospace Industry, **Applied Economics**, 30, pp715-726, March/April.

BERR (2008). **Evaluation of CARAD Programmes**, TSO, London.

BERR (2008a). **The 2008 R&D Scoreboard**, BERR, London.

BERR (2008b). **The 2008 Value Added Scoreboard**, BERR, London.

BERR (2008c). Cross Country Productivity Performance at Sector Level: the UK compared with the US, France and Germany: authors: Mason, G., O'Leary B., O'Mahoney, M. and Robinson, K., BERR Occasional Paper No10, London, February.

BIS (2009). **Aerospace Overview**, web page, September.

Barnett, C (1986). **The Audit of War**, Macmillan, London.

Barnett, C (1995). **The Lost Victory**, Macmillan, London.

Chalmers, M, Davies, N, Hartley, K, and Wilkinson, C (2002). The economic costs and benefits of UK defence exports, **Fiscal Studies**, 23, 3, 343-367.

DIS (2005). **Defence Industrial Strategy**, Ministry of Defence, Cmnd6697, TSO, London, December.

DTI (2004). **Productivity in the UK Aerospace Industry**, paper for AIGT (2006), London.

Elstub (1969). **Productivity of the National Aircraft Effort**, Ministry of Technology, HMSO, London.

EC (2007). **European Innovation Scoreboard 2006**, European Commission, Brussels.

Flight (2009). A new trade war, **Flight International**, Surrey, 28th July-3rd August.

Flight (2009a). Top 100, **Flight International**, Surrey, 8-14 September, pp42-50.

Gardner, N (1975) in Whiting, A. (ed). **The Economics of Industrial Subsidies**, Department of Industry, HMSO, London.

Hartley, K. (1965). The mergers in the UK Aircraft Industry, **Journal of the Royal Aeronautical Society**, 69, 660, pp846-852.

Hartley, K. (1996). The defence economy in Coopey, R. and Woodward, N., eds, **Britain in the 1970s**, UCL Press, London.

Hartley, K. And Braddon, D. (2002). **Aerospace Competitiveness Study**, Study for DTI, London, March.

Hartley, K (2006). Evidence and Memorandum, **The Defence Industrial Strategy**, House of Commons Defence Committee, HCP824, TSO, London, May.

Hartley, K (2006a). **The Industrial and Economic Benefits of Eurofighter Typhoon**, Eurofighter, Munich.

Hartley, K. (2008). Collaboration and European defence industrial policy, **Defence and Peace Economics**, 19, 4, 303-315.

- Hayward, K (1983). **Government and British Civil Aerospace**, Manchester University Press, Manchester.
- Hayward, K (1989). **The British Aircraft Industry**, Manchester University Press, Manchester.
- Hayward, K. (2009). **Offers they couldn't refuse: Mergers in the British Aircraft Industry**, Royal Aeronautical Society, London.
- HCP 151-1 (2005). **The UK Aerospace Industry**, House of Commons Trade and Industry Committee, TSO, London, April.
- HCP 824 (2006). **The Defence Industrial Strategy**, House of Commons Defence Committee, TSO, London, May.
- Laguerre, C. (2009). Is the defence market contestable? The case of military aerospace, **Defence and Peace Economics**, 20, 4, 303-326.
- Lawrence, P. with Braddon, D. (2001). **Aerospace Strategic Trade**, Ashgate, Aldershot.
- MacKay, Sir Donald (2005). **UK Aerospace Industry**, Presentation to SBAC, London, September.
- Parker, D (2009). **The Official History of Privatisation**, volume 1, Routledge, London.
- Peden, G. C. (2007). **Arms, Economics and British Strategy**, Cambridge University Press, Cambridge.
- Plowden (1965). **Report of the Committee of Inquiry into the Aircraft Industry**, Cmnd 2853, HMSO, London.
- Pugh, P. (2007). **Source Book of Defence Equipment Costs**, Dandy Booksellers, London.
- Review Board, (2009). **Report on Annual Review of the Profit Formula for Non-Competitive Government Contracts**, Review Board for Government Contracts, TSO, London.
- SBAC (2000). **UK Aerospace Facts and Figures, 2000**, Society of British Aerospace Companies, London.
- SBAC (2009). **UK Aerospace Industry Survey 2009**, London.
- SIPRI (1999). **Yearbook 1999**, Stockholm International Peace Research Institute, Oxford University Press, Oxford.
- Tisdell, C. and Hartley, K. (2008). **Micro-economic Policy**, Elgar, Cheltenham.

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