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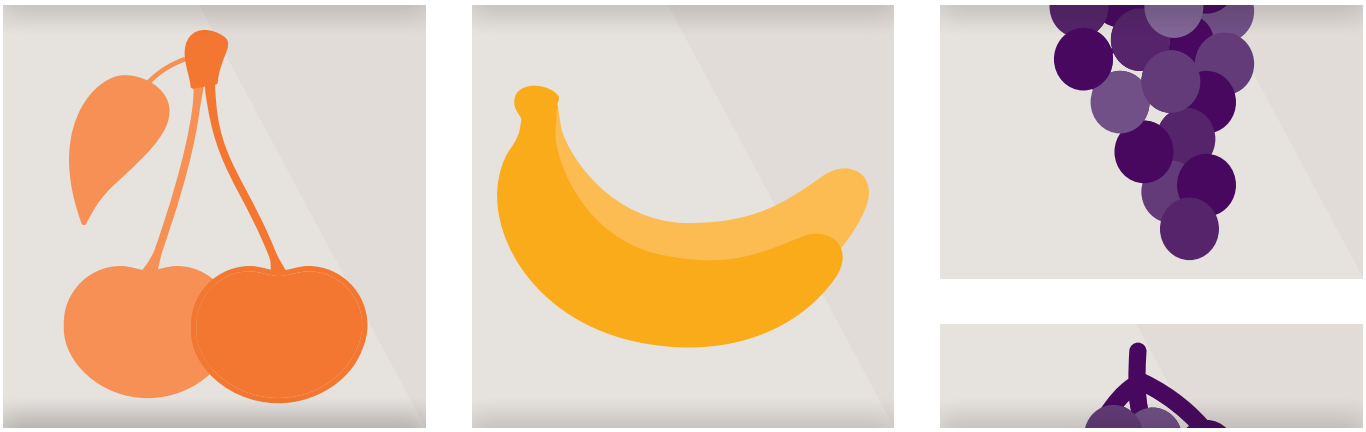

BACKING CLUSTERS TO BOOST BRITAIN'S EXPORTS

Tony Dolphin

December 2014

Institute for Public Policy Research

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IPPR
4th Floor
14 Buckingham Street
London WC2N 6DF
T: +44 (0)20 7470 6100
E: info@ippr.org
www.ippr.org
Registered charity no. 800065

This paper was first published in December 2014.

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ABOUT THE AUTHOR

Tony Dolphin is senior economist and associate director for economic policy at IPPR.

ACKNOWLEDGMENTS

The author is particularly grateful to Riccardo Di Clemente, who conducted much of the quantitative analysis presented in the second half of chapter 3 of this report. Riccardo is a postdoctoral fellow at the ISC-CNR Institute of Complex Systems in Rome and was recently a visiting scholar at the Institute for New Economic Thinking at the University of Oxford. He specialises in the application of tools from physics and mathematics in the fields of economics, finance and the social sciences. His work in Rome is funded by European and Italian grants: EU project No. 611272 'GROWTH-COM' and Italian PNR project 'CRISIS-Lab'.

The author is also grateful to Luciano Pietronero, Matthieu Cristelli and Andrea Tacchella for comments and advice on modelling; to Fabio Saracco for work on data-cleaning; to Eric Beinhocker for support throughout the development of the project; to Amna Silim for research assistance; and to Nick Pearce and Will Straw for comments on an earlier draft of this report.

The author would also like to thank Lord Sainsbury of Turville for his support for this project.

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Dolphin T (2014) *Gathering strength: Backing clusters to boost Britain's exports*, IPPR.
http://www.ippr.org/publications/gathering-strength-backing-clusters-to-boost-britains-exports

SUMMARY

The UK is living beyond its means in the global economy, and has been doing so for some time. It has recorded a current account deficit in every one of the last 30 years, and the deficit in 2013 was, at 4.2 per cent of GDP, the second largest since comparable data began over 60 years ago. The government is right to say that stronger export growth is needed to rebalance the economy – and to reduce the current account deficit – but the latest data does not paint an encouraging picture. The chancellor has set a target for exports to double between 2011 and 2020, but in the first nine months of 2014 they were 1.6 per cent lower than in the first nine months of 2011.[1]

In the wake of the financial crisis, the value of sterling fell sharply against other major currencies, but this was not followed by rapid growth in the UK's exports. In part, this was due to sluggish demand in the eurozone, which is still Britain's main export market. However, beyond this, the analysis in this report suggests that the UK lacks the industrial capacity to respond to a fall in sterling by increasing exports. Its export performance is heavily reliant on the financial and business services sectors, and they suffered a major collapse in demand after 2008.

Analysis of export data across more than 1,100 goods and over 100 countries shows that, contrary to standard economic theory, the countries that are most competitive in the global economy – such as Germany – tend to diversify rather than specialise. The UK, however, has become more specialised in its exports, which helps to explain its lack of competitiveness in international markets.

The UK has a revealed comparative advantage (RCA)[2] in every service sector, but in only three out of 15 goods sectors: pharmaceuticals, aerospace and chemical and related industries. This is fewer than any other G7 country. Instead, there has been a tendency for the UK's exports of services to increase at the expense of exports of goods.

There are, nonetheless, some UK export success stories in the goods sector. The UK has had persistently high RCAs for the pharmaceutical and aerospace sectors and a trend to higher RCAs for transport equipment – reflecting the success of the UK's car industry in boosting exports to record highs – and in the last few years for machinery and precision instruments. This suggests that the UK has existing capabilities in these areas and that they are where the UK is most likely to find new opportunities to develop export strengths.

New analysis of the UK's 'economic fitness' undertaken for this report also reveals a lack of diversity in the UK's exports compared to other countries. Worryingly, the UK's export 'basket' has become less diverse since 1995, continuing a trend that began around 1980, and the average complexity of the goods exported by the UK has also declined. In particular, the UK experienced a large loss of diversification and competitiveness in its goods exports between 2007 and 2009 – at exactly the same time that financial sector exports fell – and it has not regained that lost ground subsequently.

Britain still has some industrial strengths: aerospace, pharmaceuticals, chemicals and automobiles. But in many cases these are reliant on the decisions of a small

1 See ONS 2014a

2 'Revealed comparative advantage' is measure of the goods and services that are over-represented in a country's export 'basket', relative to that product's share of world trade.

number of large global firms to base significant amounts of activity in the UK. This creates fragility. Anything that might make Britain a less attractive place for global big business to set up activity – such as exit from the European Union, higher taxes, a decline in infrastructure, or restrictions on migration – would place these strengths at risk.

Continuing to focus on a narrow range of goods and services to export is not an option; the lack of diversity in the UK's exports makes it hard to increase our share in global markets and to narrow the current account deficit. The economy needs a long-term strategy to raise our performance across sectors where we perform poorly at the moment and to deliver a gradual shift into additional areas of export strength – working out from areas of strength into adjacent areas in order to make the best use of existing capabilities. All the evidence from the UK's history and the experience of other countries is that this will only happen if policymakers take an active role in supporting the diversification of the country's industrial base. A primary aim of economic policy should be making the UK economy look more like those economies that perform well in global markets, in particular by increasing substantially the number of product areas that are export strengths.

One way to achieve this aim is to support industrial clusters. As a result of the interaction, collaboration and competition that goes on there, industrial clusters are hotbeds of entrepreneurialism, innovation, productivity gains and economic diversification. They represent proven areas of competitive advantage and are ideally placed to develop new ones, thereby enabling the cluster – and in turn the UK – to widen its scope. Clusters generate productivity advantages that support high-wages centres and inhibit competition from other countries.

An industrial strategy that focuses on clusters would be a strategic departure from the approach that has dominated much of the last three decades, when growth has been promoted through mainly sector-neutral horizontal policies. But it would not be a return to the 1970s-style industrial strategy often characterised as 'picking winners'.[3] Instead, support would be given to entire clusters, which include firms from a number of industries as well as other institutions, such as universities. Within any cluster, it is still the market, not government, that will decide which firms are ultimately successful.

As it happens, policies implemented since the financial crisis and recession have tended to move UK industry in this direction. The Department for Business, Innovation and Skills has, for example, identified key industrial sectors to support and set up the Green Investment Bank and the Business Bank. We argue that these moves need to be built on further.

Policy should foster networks, strengthen collaboration, and improve the competitiveness of entire clusters, rather than investing in single firms or industries. It should steer clear of attempts to create new clusters; instead, it should identify existing clusters where there is a recognised competitive advantage or the potential to develop one. Unlike the defensive approach that characterised the 1970s, this would not mean backing declining sectors and industries. Instead, it would support emerging industries or high-tech clusters that have potential strong competitive advantages that are yet to be fully exploited.[4]

3 In fact, there were two distinct phases to industrial policy in the 1970s. The first phase might more accurately be described as 'propping up losers': backing industries that were thought to be experiencing cyclical difficulties but which, it turned out, were actually in structural decline. The second phase was a more sophisticated attempt to identify industrial sectors that were likely to grow relatively strongly and to provide backing for them.

4 This approach need not be limited to export sectors or those that are clustered. The same principles can be applied to domestic-oriented sectors, such as social care – this sector is not clustered or exported, but there is high demand in this area and it merits a proper sectoral approach. However, the focus of this report is on the need to improve the UK's export performance and the role clusters can play in achieving this goal.

Analysis suggests that three factors are crucial to the success of a cluster: strong networks, a high level of innovation (and access to finance to fund it) and a skilled workforce. These are the areas where the government should concentrate its help.

There are many ways in which government can act as a broker to encourage greater interconnectivity and strategic coordination between new and existing firms in a cluster. The most long-lasting are likely to be those that create partnerships and joint projects, such as joint procurement bids and coordinated research activities. Already, Catapult centres have successfully brought together researchers and businesses to develop new ideas and commercialise them, and the government should commit to making these a permanent feature of the UK's industrial landscape. The length of time that it offers financial support to the existing centres should be extended, recognising that successful research requires a long-term commitment, and many more new centres should be established, focussed on areas of research excellence in Britain's universities.

Innovation is essential if clusters are to survive and thrive. A key role for government is to fund basic scientific research. If the UK's science budget is frozen in nominal terms in the next parliament (which is likely to be a relatively generous settlement), by 2020 it will have been cut by around a fifth in real terms since 2010. This would be a blow to the prospects of an innovation-led boost to the UK's competitiveness and its ability to compete in global markets. The government should avoid this outcome and put in place a 10-year plan to boost innovation.

Finance is frequently a barrier to starting up a new business or expanding a relatively new one; there is a longstanding structural lack of supply of finance at the early stage of cluster development. Governments can improve the funding of innovation by directly investing in a venture or by matching investment from the private sector. Contrary to the aversion for 'picking winners' in the UK, assessments have found that finance earmarked for specific purposes and particular projects is more effective than general subsidies or grants without a clear set of objectives. Providing finance for start-ups and relatively new businesses that are looking to expand is a role that could be fulfilled by a British Investment Bank operating through a regional branch network to ensure investments were made on the basis of a high degree of knowledge about the firm, its prospects and its market.

Successful innovation-led clusters require people with specialist skills. In the UK, skills gaps – particularly a shortage of graduates in science, technology, engineering and mathematics (the STEM subjects) and of people with the vocational skills required by manufacturers – hold back the development of clusters. Employers need to become much more involved in the transition of young people from education into employment, and in vocational education and training in particular. The development of skills should be seen as a collective process between firms and their workforces. Employers within clusters need to work together to identify future skills needs and to coordinate, plan and purchase skills training. They need to collaborate with local further education providers to ensure that the right courses are available and that curriculums cover the essential elements needed for the work opportunities they will be offering. There also need to be big improvements in college-based vocational education and training so that it can better support the development of the skills crucial for specific clusters.

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We believe that an industrial policy focussed on supporting clusters in these ways has the potential to reverse the long-running failure to diversify the UK's export base. The long-term payoff of this kind of rebalancing act would be a stronger, more resilient economy and a trade account that means the UK is no longer failing to pay its way in the world.

1. INTRODUCTION

In every one of the last 30 years the UK has recorded a current account deficit, and in the last two years the deficit has increased in size. In 2013 it was £72 billion, equivalent to 4.2 per cent of GDP, which is a figure that has been exceeded only once in the postwar period (ONS 2014b). The UK is living beyond its means in the global economy.

A current account deficit can exist for a number of reasons and is not necessarily a sign that a country is uncompetitive in global markets. However, a current account deficit that has persisted for 30 years – and that did not narrow even when the UK's relative productivity growth was strong in the decade leading up to the financial crisis – indicates an economy that is structurally weak at exporting. If this does not change then the UK's current account deficit is likely, eventually, to prove to be a serious liability.

Traditional economic theory says that countries should specialise in what they are comparatively good at producing. It follows from this argument that the solution to the UK's current account problem is to find ways to sell abroad more of those goods and services that it already successfully produces for export, such as financial services and aerospace products.

However, some economists have recently begun to analyse the competitiveness of countries in a new way, based on the observation that the most competitive countries do not specialise but in fact have a high degree of diversification in their exports. Professor Luciano Pietronero and his colleagues in Italy have used this insight to develop a new measure of an economy's 'fitness' – or competitiveness in the global economy (Cristelli et al 2013). Pietronero's work builds on the ground-breaking work of Professor Ricardo Hausmann of Harvard University and Dr Cesar Hidalgo of the Massachusetts Institute of Technology, who have used new economic thinking in the fields of network theory and complexity science to understand the interconnectedness of different industries and product systems within a national economy (see for example Hausmann et al 2011).

Hausmann and Hidalgo argue that it is industrial diversification, not specialisation, that drives national wealth creation. By this view, the increasing interconnectedness of products and services means that greater diversification is associated with the accumulation of more 'capabilities' – the things that are required to allow particular goods and services to be produced. The more capabilities an economy has, the better placed it is to create new areas of comparative advantage, which can generate strong export growth (and a higher national income per head). If this is right then the UK, to solve its current account problem, needs to develop *new* export strengths, rather than relying ever more heavily on those that it already has. In short, policymakers should seek to diversify the economy's industrial base. One way this should be done is by encouraging and facilitating greater interconnectivity and strategic coordination between new and existing industries; that is, by supporting 'clusters' of industries.

Industrial clusters are 'geographical concentrations of interconnected companies, specialised suppliers, service providers, firms in related industries, and associated institutions'.[5]

5 See: http://webarchive.nationalarchives.gov.uk/+/http://www.bis.gov.uk/policies/economic-development/clusters-in-the-uk

Michael Porter (1998), the world's foremost advocate of the centrality of industrial clusters to innovation and growth in modern economies, argues that clusters are important for a number of reasons. First, by concentrating firms operating in a similar field into a particular geographical location, clusters encourage high performance, innovation and entrepreneurialism. Second, geographical proximity encourages interaction and cooperation between firms and institutions, which can lead to knowledge-sharing and better access to human capital and university research. Third, clusters act as a magnet, attracting other companies, support services and investors to an area. Finally, clusters create spin-off industries that drive further innovation, productivity gains and economic diversification. Overall, the result is a stronger economy, with higher output, productivity, inward investment and job-creation – and, crucially, more products that can be sold in international markets.

Clusters are already an important contributor to the output of the UK economy. According to a recent report from the Centre for Cities and McKinsey and Company, the 31 most economically significant clusters accounted for one-fifth of gross value-added (GVA) in the UK in 2012 and employed one in seven of the workforce (CfC 2014: 2). That report goes on to set out the strengths of clusters and the barriers that limit their growth, as well as identifying a set of changes that would reduce these barriers.

This report takes a different but complementary approach. It uses the Hausmann and Hidalgo insights and Pietronero methods to develop a better understanding of the role industrial clusters can play in improving the UK's export performance, and what policymakers can do to support them. Chapter 2 presents a brief history of the UK's trade performance, highlighting the need for the economy to develop new areas of export strength. Chapter 3 looks at what revealed comparative advantage (RCA) analysis says about the export strengths of the UK economy, and presents new analysis based on the 'economic fitness' approach to show that – compared to similar economies – the UK has relatively few sources of industrial strength. Chapter 4 reviews the traditional academic literature on clusters and how cluster formation occurs in practice. It examines the evidence suggesting that industrial agglomeration attracts inward investment, drives growth in output and employment, and enables countries to develop new areas of comparative advantage, so boosting exports; and assesses possible policy prescriptions and the role of government in supporting clusters. It also presents some analysis of existing clusters in the UK. Finally, Chapter 5 argues for a new way of thinking about industrial and innovation policy in the context of seeking to improve the UK's export performance through the promotion of clusters.

2.
WHY THE UK NEEDS TO IMPROVE ITS EXPORT PERFORMANCE

2.1 Rebalancing the economy

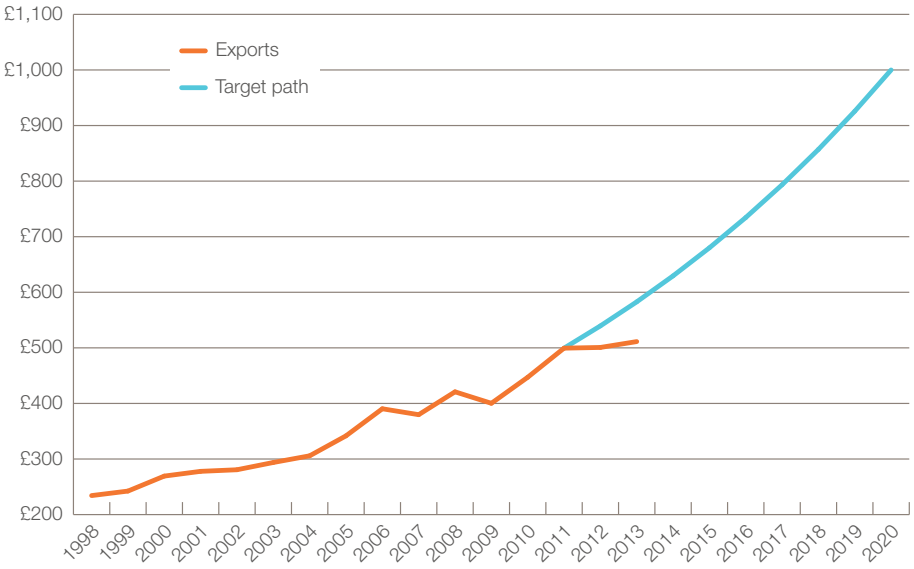
Since the financial crisis of 2007/08 and subsequent recession, it has become commonplace for economists and politicians to argue that the UK needs to rebalance its economy away from 'debt-fuelled consumption' and towards a greater reliance on investment and exports for growth. In his 2011 budget, for example, the chancellor George Osborne said:

> *'We want the words "Made in Britain, Created in Britain, Designed in Britain, Invented in Britain" to drive our nation forward. A Britain carried aloft by the march of the makers.'*
> FCO and Osborne 2011

A year later, in the 2012 budget, he set an ambitious target: 'We want to double our nation's exports to one trillion pounds this decade' (Osborne 2012).

Exports are currently some way off the path needed to hit this target. Exports in 2011 were £499 billion, which meant that annual growth of 8.0 per cent was needed between 2011 and 2020. But exports grew by only 2.4 per cent between 2011 and 2013, when they totalled £511 billion. As a result, the annual growth rate needed if exports are to reach £1 trillion by 2020 has increased to 10.1 per cent.[6]

Figure 2.1
UK exports, actual and projected to £1 trillion target, 1998–2020 (£bn)



Source: Office for National Statistics, Balance of Payments, Q2 2014 (ONS 2014b)

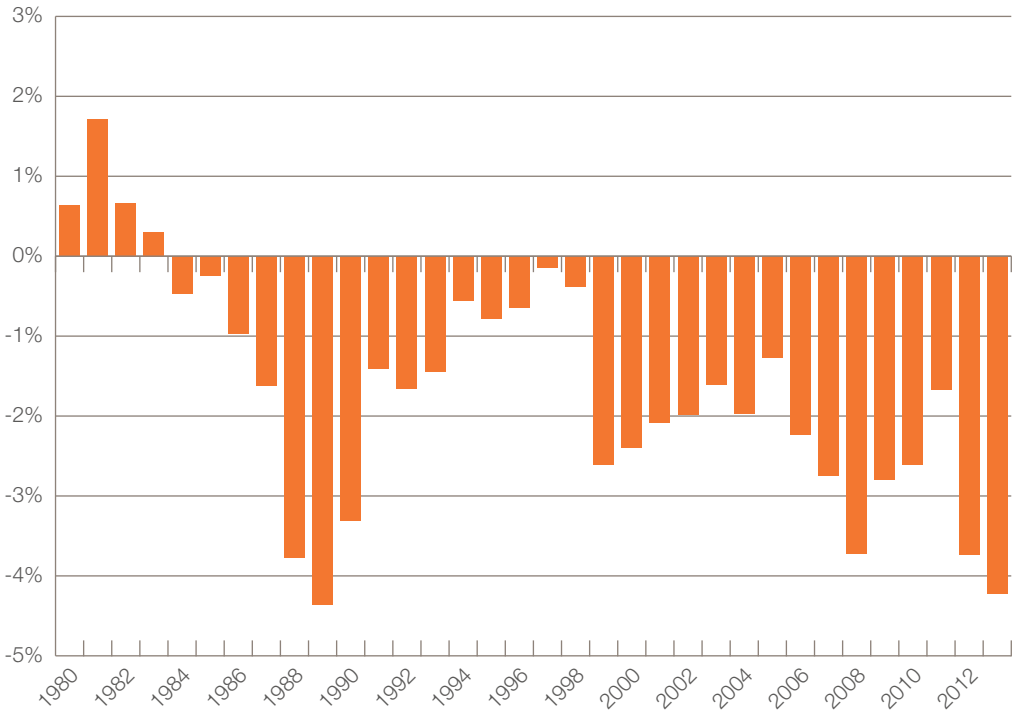
6 And exports are falling even further behind the required trajectory in 2014. In the first half of 2014, exports were £245 billion, 4 per cent *lower* than a year earlier.

In the decade to 2008, a period when global demand increased at a rapid pace, UK exports grew at an annual rate of 6.0 per cent. Most forecasters expect more modest growth in global demand through the rest of this decade, so a considerable improvement in the UK's export performance is needed if exports are going to come anywhere close to reaching the £1 trillion target.

2.2 The UK's persistent current account deficit

At the moment, it appears unlikely that this considerable improvement is achievable. This is because the UK's poor export performance – or more generally trade performance[7] – is not a new phenomenon. Rather, it dates back to the 1980s – in the global economy, we have been living beyond our means for the last three decades.

Figure 2.2
UK current account balance, per cent of GDP



Source: Office for National Statistics, Balance of Payments, Q2 2014 (ONS 2014b) and Quarterly National Accounts, Q2 2014 (ONS 2014c)

These deficits have been financed by selling assets to overseas buyers. The result is that large swathes of British industry and infrastructure are now in foreign ownership. In some instances, this has been positive for the economy because overseas firms have invested in new productive capacity or rescued British firms destined for bankruptcy. The British car industry, for example, would be substantially smaller were it not for overseas investment, which has created or saved many jobs. In other cases, however, the benefits are less clear. Kraft's takeover of Cadbury was followed by the closure of a factory in the UK that it previously had said would be kept open. More recently, resistance to Pfizer's bid for Astra-Zeneca was led by

7 The arguments in this report are framed in terms of strengthening export industries and opportunities, but the same arguments can be made for strengthening industries that compete with imports as an alternative way of cutting the current account deficit.

those who feared that it was motivated by tax considerations rather than a desire to increase, or even preserve, existing research and production capacity in the UK.

There is no way of knowing how much longer Britain can continue to live beyond its means in this way. At present, there are no signs – such as a chronic weakening of the currency – to suggest that overseas appetite for British assets is waning. Indeed, sterling strengthened against the US dollar and the euro in the first nine months of 2014. But there is always a risk that, if the UK's export industries are not reinvigorated, financing the current account deficit will become more difficult at some point in the future. This would probably lead to a sharp fall in the value of sterling. The deficit would then have to be reduced by cutting back imports, which could only happen on a sufficient scale if the economy went into recession. Osborne and others are right to argue that the economic recovery is only likely to be sustained if it is accompanied by a much stronger export performance and a narrowing of the UK's trade gap.

As figure 2.2 shows, within the last 30 years, only in the mid-1990s – when the UK's trade performance was boosted by the 20 per cent devaluation of sterling that occurred after the pound was ejected from the European exchange rate mechanism – has there been an export-led improvement in the current account balance. However, despite a similar depreciation of sterling between the third quarter of 2007 and the first quarter of 2009 (this time by 25 per cent), the current account deficit, which shrank briefly while the UK was in recession, has not shown a similar improvement. In 2012 and 2013, when the economy began to grow again, current account deficits increased. In 2013, the current account deficit was £72 billion, or 4.2 per cent of GDP. In the whole of the postwar period, only once has the annual deficit been larger: in 1989, when it was 4.4 per cent of GDP.[8]

Statisticians at the Office for National Statistics (ONS) have analysed this poor performance and come up with several possible explanations (Hardie et al 2013). These include the growth of global supply chains, developments in the UK financial sector, increases in commodity prices, relative price movements of exports and imports more generally, and developments in overseas demand – in particular, the effect of the crisis in the eurozone. They were, however, reluctant to evaluate the relative importance and impact of these factors.

Developments in the financial sector appear to have had a major impact on the UK's overall current account position. In the years up to 2008, exports of financial services were accounting for an increasing proportion of the UK's overall exports. This concentration left the trade position vulnerable to the effects of the global financial crisis. Since 2007, exports of financial services have grown by just 3 per cent, compared to growth of 139 per cent in the preceding six years (ONS 2014b). This has been a significant drag on the UK's overall trade performance.

2.3 The composition of exports

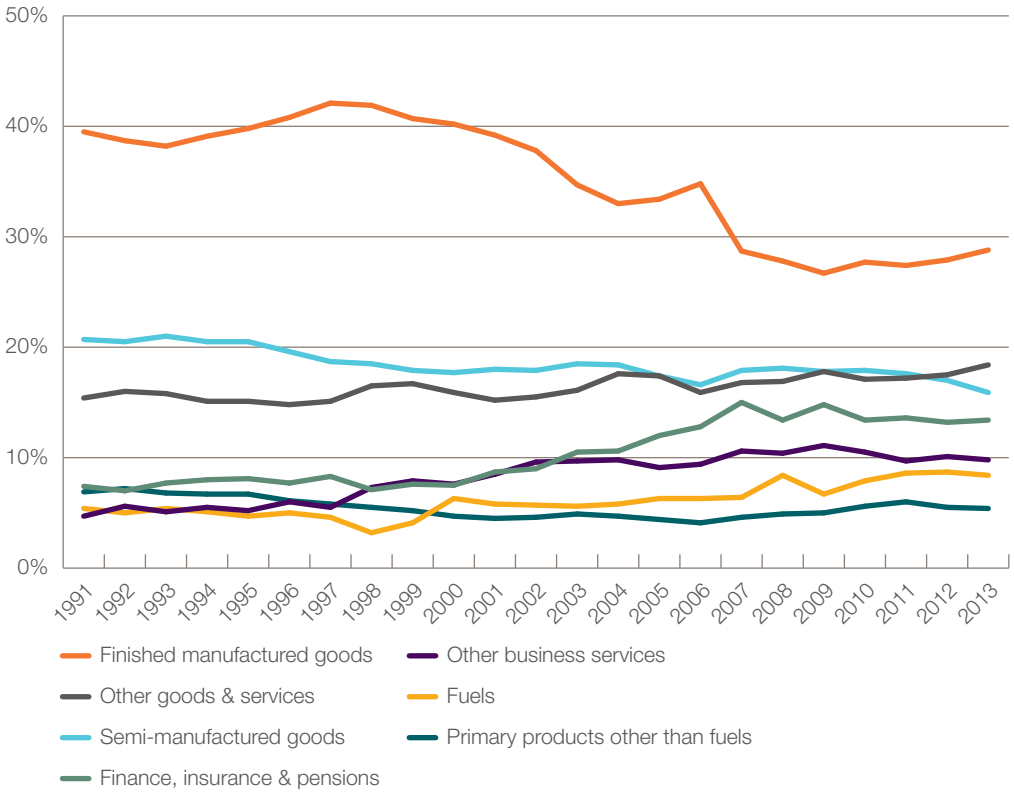
Even allowing for the particular problems facing the financial sector – and for the crisis in the eurozone, which has affected demand in the UK's biggest export market – the sluggish growth in UK exports over the last two years is disappointing. It suggests that, outside of a small number of very successful industries, such as aerospace and automobiles,[9] the UK lacks the capacity to produce significantly more goods for export. It is likely that this is the result of two periods of 'Dutch disease', where the prominence of one part of the economy has led to a crowding

8 Although this record could be broken in 2014. The latest figures, for the first two quarters of 2014, show a deficit of £44 billion, equal to 4.9 per cent of GDP.

9 Aerospace exports increased by 25 per cent between 2008 and 2013, while exports of transport equipment were up by 12 per cent. Total exports of products (excluding erratic items) were up by just 0.5 per cent (author's calculations based on International Trade Centre data: http://www.intracen.org/itc/market-info-tools/trade-statistics/).

out, through the exchange rate, of export activity in other parts. In the 1980s, the culprit was North Sea oil; in the 1990s and 2000s it was the finance sector. In both cases, the strength of these sectors boosted sterling's exchange rate, resulting in a loss of competitiveness for much of the rest of the economy. One consequence was that manufacturing employment in the UK shrank throughout this period at a more rapid pace than in comparable countries (Dolphin 2013: 35–36).

Figure 2.3
Share of UK exports of goods and services, by sector



Source: Office for National Statistics, Balance of Payments, Q2 2014 (ONS 2014b)

Over the last 20 years, the UK's export industries have seen significant change. Financial and other business services have significantly increased their share of exports at the expense of semi-manufactured and finished manufactured goods (see table 2.1).[10] And within the goods sector, there have been big declines in the share of exports accounted for by intermediate and capital goods and materials manufactures, offset in part by increases in the share of chemicals and passenger cars.

Similar though generally less strong trends can be observed in other advanced economies and, for much of this period, this change in the composition of exports was seen as a sign that the UK was successfully finding a position for itself in global markets: focussing on higher value-added areas, particularly services, in response to the increasing importance of emerging economies in the global market for lower value-added goods. In hindsight, however, it is apparent that the UK was unable to increase its share of global trade in services sufficiently rapidly to offset the decline in its share of global trade in manufactured goods, which was happening faster than in other comparable countries.

10 The share of oil is also up due to a large increase in its relative price.

Table 2.1
Share of UK exports, by type of good and service

Type of good and service	Share in 2013 (%)	Change from 1993 (percentage points)
Food, beverages, tobacco	3.9	-1.6
Basic materials	1.5	+0.2
Fuels	8.4	+3.0
Semi-manufactured goods	15.9	-5.1
Finished manufactured goods	28.8	-9.4
Unspecified goods	1.6	+0.6
Transport	4.7	-0.5
Travel	5.1	-1.1
Insurance and pension	4.3	+0.6
Financial	9.1	+5.1
Telecom, computer and information	2.6	+2.2
Intellectual property	1.6	-0.1
Other business	9.8	+4.6
Other services*	2.8	+1.5

Source: Office for National Statistics, Balance of Payments, Q2 2014 (ONS 2014b)
***Manufacturing and maintenance, construction, personal, cultural and recreational, and government services.**

The result is that the British economy no longer appears to have the capacity in the right industries to take advantage of the increased competitiveness that results from a fall in the value of sterling. A sustainable improvement in export performance will only happen if the government adopts an explicitly pro-export industrial and innovation strategy. This should aim to maximise the opportunities for existing export sectors while also developing new strengths in the export of manufactured goods and services. The government already has strategies for those sectors of the economy that have been identified as existing strengths, including the aerospace and automobile industries (BIS 2012). But these industries are not large enough to generate the exports needed to hit the government's £1 trillion export target and to eliminate the current account deficit. New areas of export strength have to be developed.

The hollowing-out of the UK's industrial capacity has been going on for the last 35 years. During this period, while other countries have supported their existing export industries and helped new ones to develop, policymakers in the UK – frightened by the country's bad experience with industrial policies in the early 1970s – have adopted a more hands-off approach. This unwillingness to intervene, combined with the dominating effects of North Sea oil and the 'financialisation' of the economy, has been a major factor in 30 years of current account deficits. An active industrial and innovation policy is now required to boost exports and reverse this long-running trend.

3.
GAUGING THE FITNESS OF THE UK ECONOMY

3.1 New thinking about comparative advantage

Traditional economic theory argues that countries should specialise in the production of goods and services for which they have a comparative advantage – that is, those goods and services that they can produce cheaply, whether due to higher levels of productivity or lower production costs, relative to other countries. Revealed comparative analysis (RCA) uses trade data – and the assumption that international markets are working efficiently – to show which countries have a comparative advantage in global markets across different sectors or industries. For any country and any sector, RCA is calculated by comparing that sector's share of a country's exports with its share of global exports, usually in the form of a ratio. An RCA of greater than 1 indicates that a sector has a disproportionately large share in a country's exports by international standards (BIS 2012: 17).[11] Thus, if the chemical industry accounts for 10 per cent of a country's exports, but only 5 per cent of global exports, then that country has an RCA of 2 in chemicals, and is said to have a revealed comparative advantage in that sector. Another country, for which chemical industry exports accounted for only 2 per cent of the total, would have an RCA of 0.4 and no revealed comparative advantage.

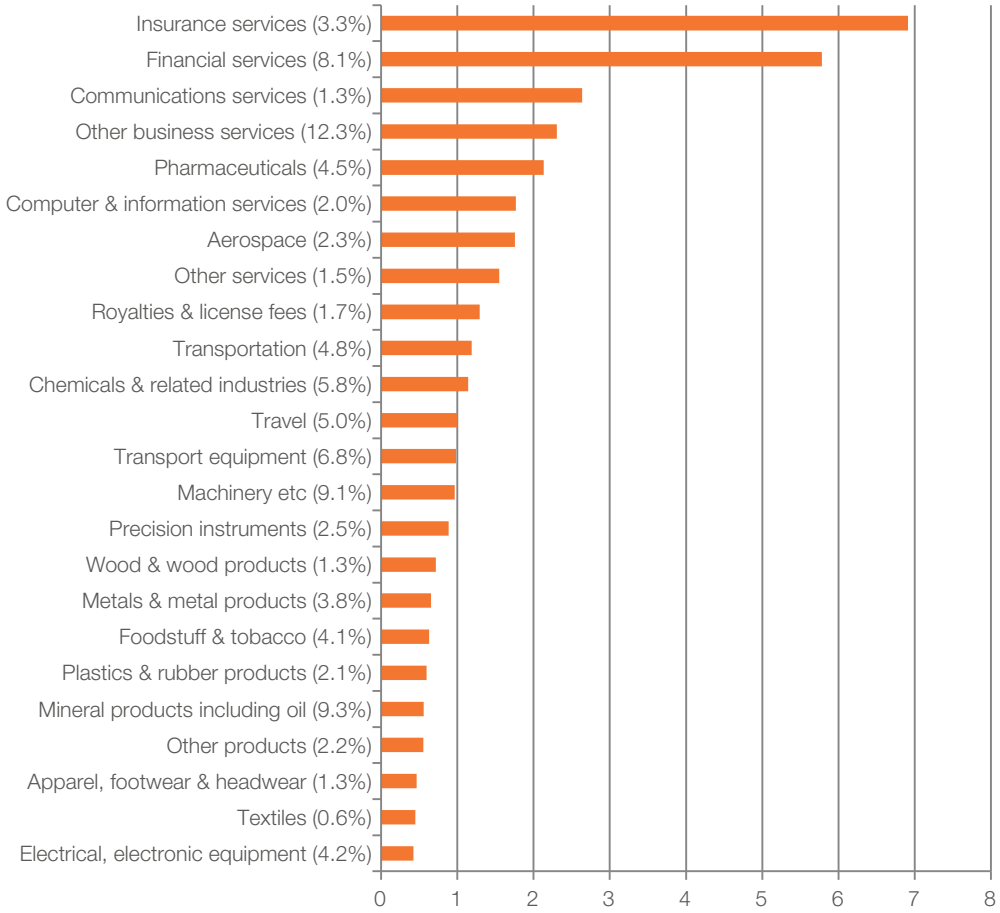
RCAs offer a snapshot of the relative importance of different sectors for a country's exports at one point in time. They need, therefore, to be treated with some caution. A temporary loss in productive capacity in the oil industry, for example, will drop the RCA of the oil sector and – other things being equal – increase the RCAs of other sectors. However, if such special factors are taken into account, RCAs can highlight the industries in which a country specialises for exports, and how these compare to other similar countries. Trends in RCAs over time can also show which industries have become more or less important to a country's export efforts. If there is good reason to expect these trends to continue, RCAs might also give some indication of potential areas to support – and, just as importantly, areas not to support – in order to enhance a country's export strength.

Through this lens, then, a clear pattern emerges from the UK's trade data for 2012.[12] The UK is good at exporting services, but – with a very few exceptions – poor at exporting goods. It has a revealed comparative advantage in every subsector of the service sector with the exception of travel (for which the RCA is equal to 1.0). Despite the effects of the financial crisis, the biggest RCAs are for insurance services and financial services. On the other hand, the only goods that the UK has an RCA in exporting are pharmaceuticals, aerospace and chemicals and related industries. Although trade data – and therefore the results of RCA calculations – can be erratic from year to year, the same pattern emerges when the analysis is repeated for each of the three years prior to 2012.

11 The RCA can also be calculated as the difference between a sector's share of one country's exports and its share of global exports, in which case a positive RCA indicates a sector that has a disproportionately large share in a country's exports and a negative RCA a sector that has a disproportionately small share.

12 Full figures for the exports of services by other countries in 2013 were not available at the time the analysis was conducted, but analysis based on preliminary and estimated data suggests the picture for 2013 would be little different to that for 2012.

Figure 3.1
UK revealed comparative advantage by sector (with sector share in total exports), 2012



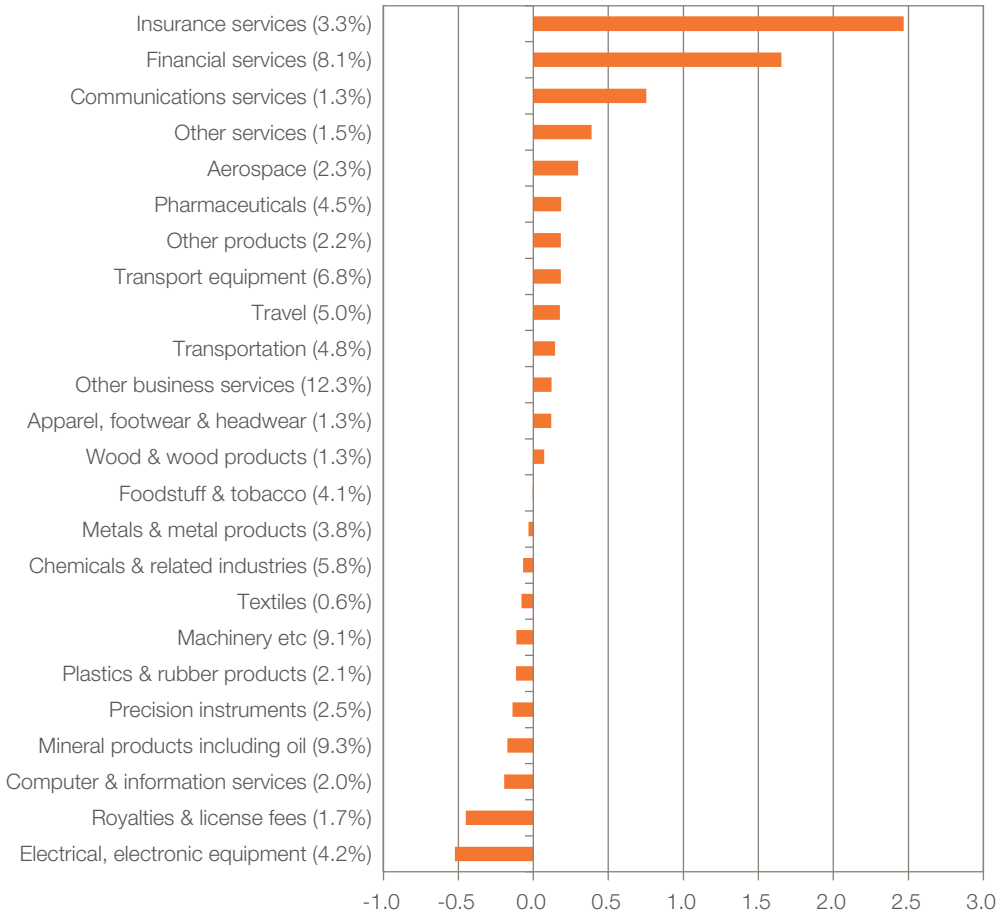
Source: Author's calculations using data from the International Trade Centre (ITC A)
Note: Erratic items – pearls, precious stones, metals, coins and works of art, collectors' pieces and antiques – were excluded from the calculation.

Trends in the UK's revealed comparative advantage can be identified by comparing the latest estimates with those for an earlier year. Figure 3.2 does this by comparing 2002 and 2012. The three subsectors in which the UK had the biggest RCAs in 2012 – insurance services, financial services and communication services – are the ones that have seen the biggest increases over the last decade; and the electrical and electronic equipment sector appears at the bottom of both tables. This suggests that the UK has been increasingly focussing its export efforts on the things it does best. However, the UK's RCAs in some service sectors have declined over the last 10 years,[13] while its RCAs in some goods sectors have increased. In particular, reflecting the growing strength of the car industry in the UK, the RCA for transport equipment is now very close to 1.[14] The narrative focussing on UK exports becoming ever more concentrated in services, offsetting inevitable decline in all goods sectors, might therefore be too simplistic.

13 The big drop in the RCA for royalties and license fees looks particularly odd, given the UK's perceived strength in the creative industries. This merits further investigation but might indicate a weakness in the protection of intellectual property.

14 UK exports of cars are at a record level.

Figure 3.2
Change in UK revealed comparative advantage by sector (with sector share in total exports) between 2002 and 2012



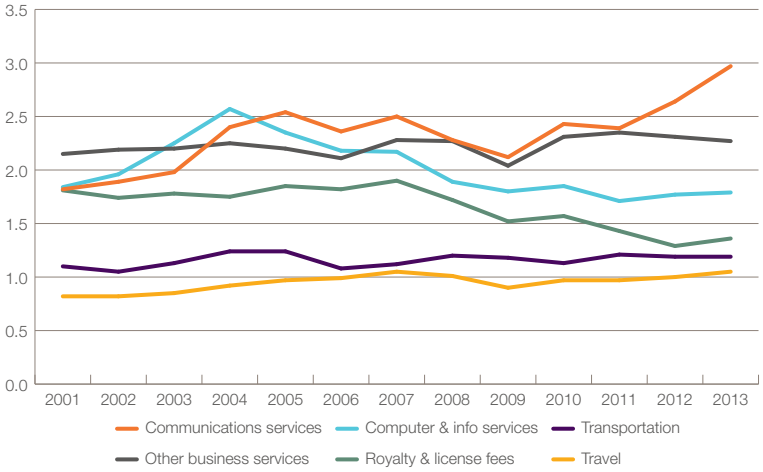
Source: Author's calculations using data from the International Trade Centre (ITC A)
Note: Erratic items – pearls, precious stones, metals, coins and works of art, collectors' pieces and antiques – were excluded from the calculation.

When data series are known to be potentially erratic from year to year, comparisons between two points in time can be misleading. A rogue high number in the first year of the comparison might mask a more general upward trend, while a rogue high number in the later year might create a false impression of an increasing RCA. This can be avoided by looking for trends in the annual data.

Figure 3.3 shows trends in the RCAs of the service sectors. Insurance and financial services are excluded because their RCAs are so much higher than those for the other sectors, and so their inclusion would stretch the y-axis and make it impossible to see trends elsewhere. For the record, there is no trend in the RCA for insurance services; it is very volatile, reflecting the incidence of major insured disasters, among other things. The trend in the RCA for financial services was upwards from 2002 to 2008, and then slightly down. The 'other services' group is excluded too. There appears to be an upward trend for communications services, transportation and travel, and perhaps for other business services too. On the other hand, the UK appears to be becoming less competitive in computer and information services and royalties and licence fees.

Figure 3.3

Trends in UK revealed comparative advantages for selected service sectors, 2001–2013

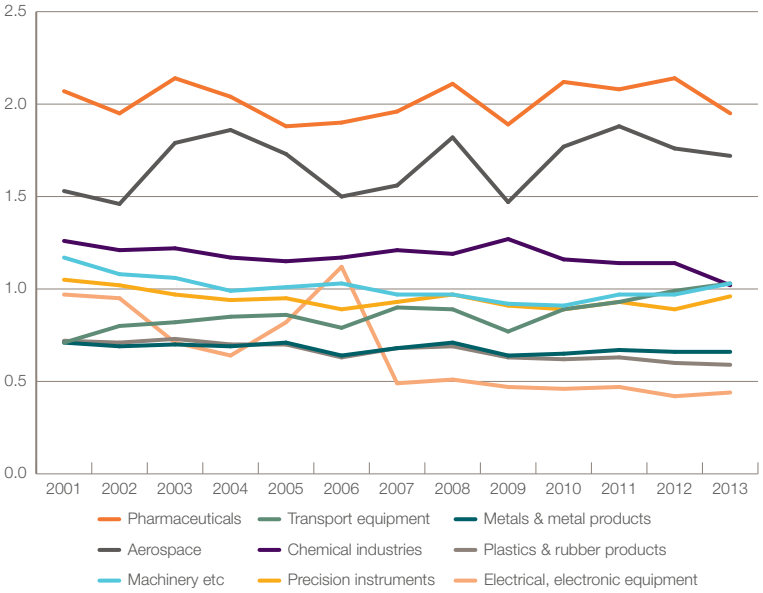


Source: Author's calculations using data from the International Trade Centre (ITC A)
Notes: Erratic items – pearls, precious stones, metals, coins and works of art, collectors' pieces and antiques – were excluded from the calculation.
Figures for 2013 are based in part on estimated data.

Figure 3.4 repeats the analysis for product sectors. The persistent high RCAs for the pharmaceutical and aerospace sectors are clear.

Figure 3.4

Trends in UK revealed comparative advantages for selected product sectors, 2001–2013



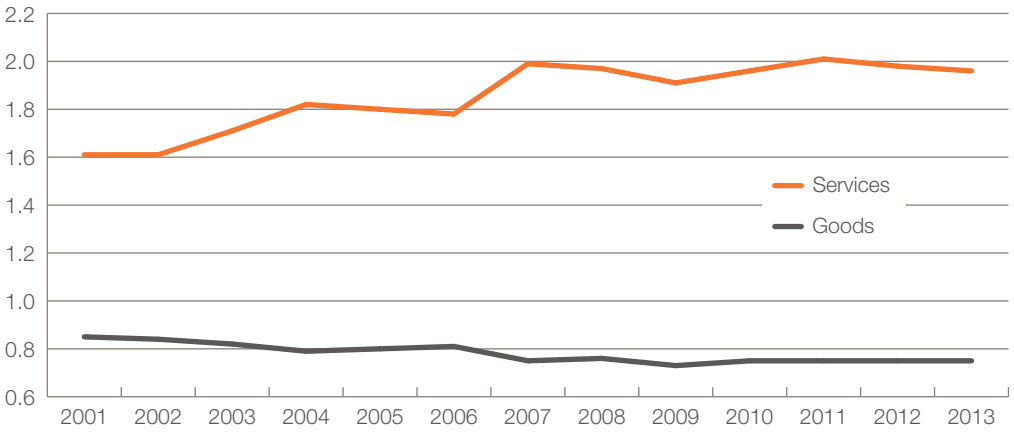
Source: Author's calculations using data from the International Trade Centre (ITC A)
Notes: Erratic items – pearls, precious stones, metals, coins and works of art, collectors' pieces and antiques – were excluded from the calculation.
Figures for 2013 are based in part on estimated data.

Less positive is the decline in the RCA of the chemical and related industries and electrical and electronic equipment sectors.

There are, however, more positive trends for transport equipment, reflecting the success of the UK's car industry in boosting exports to record highs, and in the last few years for machinery and precision instruments. This suggests that these are areas where the UK has existing capabilities and where new opportunities to develop export strengths are most likely to be found.

At a more aggregated level, there is a clear pattern: the UK's RCA in services has been increasing, while its RCA in goods has declined.

Figure 3.5
Trends in UK revealed comparative advantages, 2001–2013



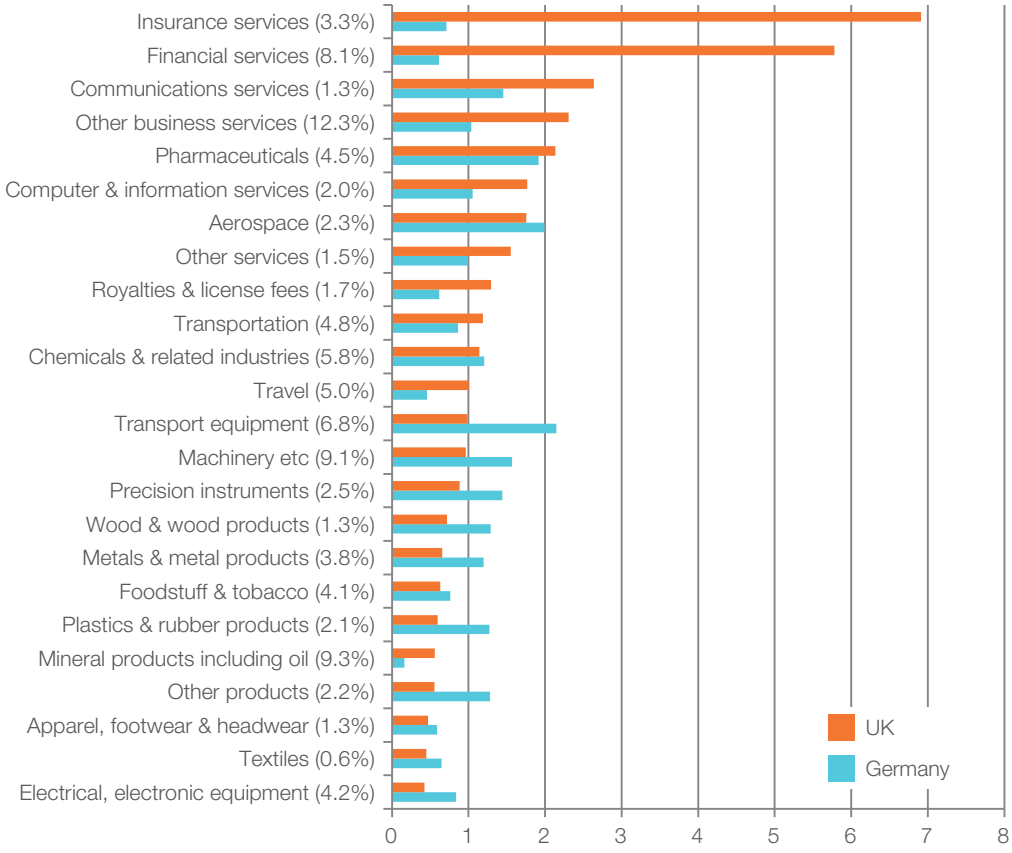
Source: Author's calculations using data from the International Trade Centre (ITC A)
Notes: Erratic items – pearls, precious stones, metals, coins and works of art, collectors' pieces and antiques – were excluded from the calculation.
Figures for 2013 are based in part on estimated data.

It is also interesting to compare the pattern of RCAs in the UK with the pattern in other major industrialised countries. Relative to Germany, for example, the UK's RCAs are much more concentrated in the service sector. Germany has a revealed comparative advantage in 10 of the 15 goods subsectors analysed in figure 3.6, the UK in just three. Overall, Germany's export strength is more diversified than the UK's, which is heavily concentrated in the related areas of insurance, financial and other business services.

Although every major industrial country has its own pattern of revealed comparative advantages, the UK's pattern is something of an outlier (see appendix 1 for alternative versions of figure 3.6 comparing the UK to France, Italy, the United States, Japan and Canada). In particular, the UK is much more reliant on exports of services than any other major industrial economy. In 2012, services accounted for 40 per cent of UK exports, compared to close to 30 per cent in the US and France and less than 20 per cent in Germany, Italy, Japan and Canada (see figure 3.7).

Figure 3.6

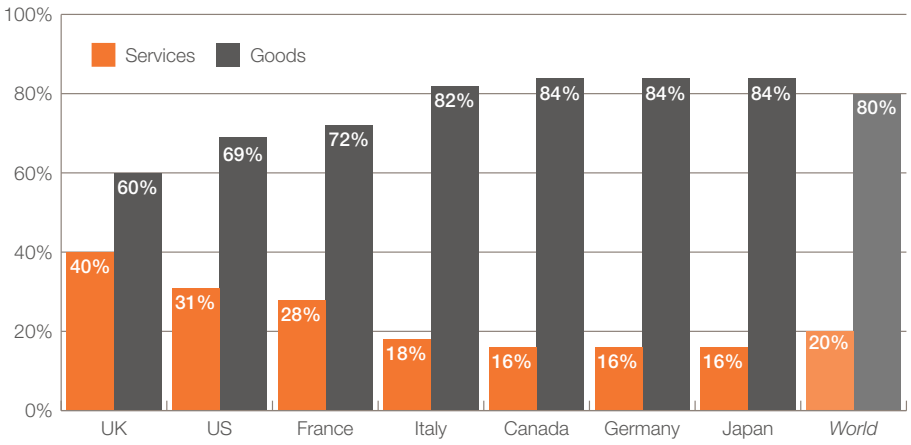
Revealed comparative advantage by sector (with UK sector share of total exports), UK and Germany, 2012



Source: Author's calculations using data from the International Trade Centre (ITC A)
Note: Erratic items – pearls, precious stones, metals, coins and works of art, collectors' pieces and antiques – were excluded from the calculation.

Figure 3.7

Split of exports, 2012 (proportion of total exports)



Source: Author's calculations using data from the International Trade Centre (ITC A)
Note: Erratic items – pearls, precious stones, metals, coins and works of art, collectors' pieces and antiques – were excluded from the calculation.

The UK has become far more reliant on the service sector for exports than other major industrialised countries. In particular, its largest revealed comparative advantages are in financial and insurance services. This helps to explain why the UK has failed to increase its share in global markets over the last several years, despite the big fall in the value of sterling in 2008 and early 2009. Demand for the services that the UK is good at exporting – those produced by the financial sector – has been significantly reduced by the financial crisis and recession. Conversely, growth in global demand over this period has for the most part been concentrated in areas where the UK does not have a revealed comparative advantage, and does not have the capacity to increase output (aerospace and transport equipment are exceptions).

The UK financial sector (including insurance and pension services) has produced large trade surpluses in recent years: in 2013, this amounted to £58 billion or 3.4 per cent of GDP (ONS 2014b, 2014c). This reflects the 'financialisation' of the economy that has taken place since the 'big bang' in the City in 1986. Despite this growth, the downside of financialisation has been a more rapid erosion of the manufacturing base than in other comparable economies (Dolphin 2013). According to figures from the OECD, employment in industry (excluding construction) fell by 30 per cent in the UK between 2000 and 2013; among the G7 countries, the next largest drop was 21 per cent in both Japan and France (OECD A).

This shrinking of manufacturing capacity is very apparent in the UK's pattern of revealed comparative advantage. As noted above, the UK has a revealed comparative advantage in just three goods subsectors; it needs more if its export performance is to revive. Germany has a revealed comparative advantage in 10 goods areas (out of a total of 15; see figure 3.6), Italy nine, Japan eight, Canada seven, the US six and France five.

3.2 New thinking about national competitiveness

This analysis of revealed comparative advantage shows that countries which are perceived to be successful at competing in the global economy, such as Germany, have a much broader range of strengths than countries like the UK, which have a high degree of concentration in their exports. This is contrary to standard economic theory, with its origins in the writings of David Ricardo in the late 18th and early 19th centuries, which says that countries should increasingly specialise in the production of those goods for which they hold a relative comparative advantage. In reality, however, successful economies are those with a very diverse product range to sell in global markets.

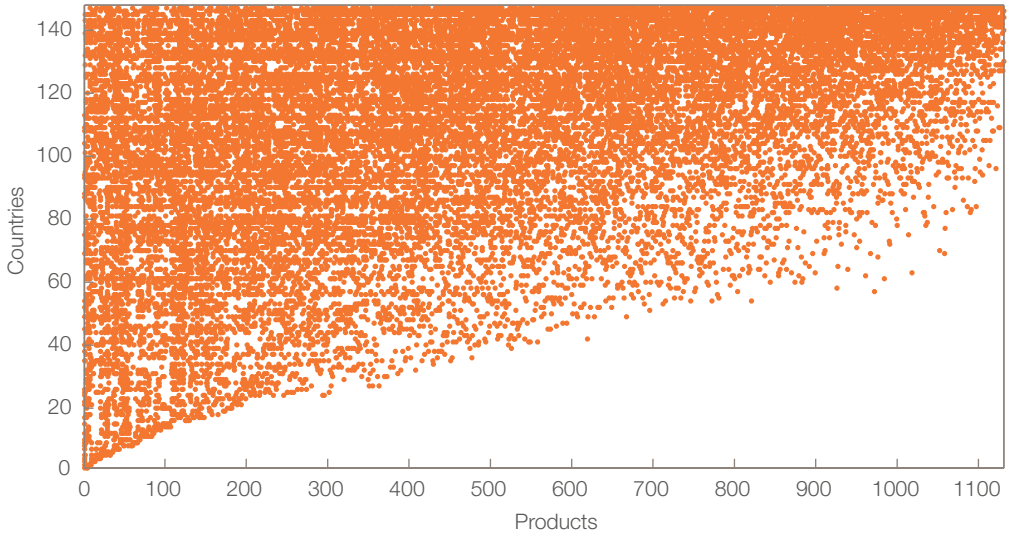
Other economists have also noted this tendency for rich and competitive countries *not* to specialise in the production of a few high value-added goods. Hausmann et al (2011) argue that the most competitive countries are the ones that produce a highly diversified range of goods and services. Poorly diversified countries can only export goods that are also exported by many other countries, but the most diversified countries are also able to export more exclusive, less widely exported goods. Cristelli et al (2013) suggest that countries 'tend to produce a wide range of products – in fact they tend to produce all the possible products they can, given their level of technology and development'.

This can be illustrated by plotting a country–product matrix, showing the products for which each country has an RCA greater than 1 – the results are shown in figure 3.8. Countries and products are both plotted in order of increasing complexity: to the left-hand side of the plot are the least complex products, like unrefined materials and basic foodstuffs, while to the right are the most complex products, like smart phones. Similarly, at the bottom of the plot are the less complex countries – those that produce mainly simple products and relatively few complex ones – and at the

top of the plot are the most complex countries, with the capabilities to produce many complex products (see Hausmann et al 2011 for more details).

In a Ricardian world, in which specialisation rules, the points on this matrix would be concentrated on a diagonal from the bottom-left to the top-right: less complex countries would produce only less complex products, while more complex countries would produce only more complex products. In fact, the matrix exhibits a triangular shape. As expected, poorly diversified countries export only the most ubiquitous and least-complex products and only the more complex economies can produce complex products. However, there are also lots of points in the top-left corner of the figure, indicating that the more complex countries are also producing less complex products too. Rather than specialising, they are diversifying.

Figure 3.8
Country–product matrix, 2010



Source: Research by Riccardo Di Clemente in collaboration with members of Professor Pietronero's team

3.3 New thinking about economic fitness

Analysis of the UK's revealed comparative advantage shows that it has tended to specialise its exports, not diversify them, and the UK's persistent current account deficits over the last three decades suggest its international competitiveness throughout most of this period has been poor. However, until the financial crisis and recession, some other traditional measures of economic performance, such as the growth of real GDP per head and productivity, were less damning (though subsequently both have disappointed massively). It was to help resolve conundrums like this one that Professor Luciano Pietronero and his colleagues at the University of Rome devised an alternative way of looking at the underlying relative competitiveness of the tradable sector of an economy: a metric they call 'economic fitness' (Tacchella et al 2012, Cristelli et al 2013).[15] This is calculated by measuring the diversity of a country's exports, weighted by their complexity. As such, it is an assessment of a country's capabilities and the use to which it is putting them.

15 The quantitative analysis in this section was undertaken by Riccardo Di Clemente in collaboration with other members of Professor Pietronero's team. It uses the BACI World Trade Database, which contains information on the exports of over 200 countries, detailed by over 5,000 products (though for the purpose of this analysis products were grouped into just over 1,000 categories).

The economic fitness measure builds on the insight of Hausmann and colleagues that advanced countries are more likely to be able to compete in global markets, in the medium term, if they produce a wide diversity of products, and if the products that they produce are complex.[16] Diversification, not specialisation, is the sign of a competitive economy. In a rapidly changing world, it also provides insurance against technological shifts and the emergence of new competitors. A complex algorithm is used to produce a measure of fitness for any given country based on the mix of products in which it has a revealed comparative advantage. Basically, a country that has a high level of fitness will have advantages in a wide range of products, including very complex ones, while a country with a low fitness score will have advantages in fewer and less complex products.[17]

Figures 3.9 and 3.10 show the evolution of the UK's competitiveness, as measured by its fitness, from 1995 to 2010. For comparison, a number of other countries are also highlighted. Figure 3.9 shows the fitness level of the UK and figure 3.10 the fitness ranking. The trend shown in figure 3.9 is for the fitness of most of the countries highlighted to fall over the period. This is due to the increased importance of emerging economies like China and India in global markets. Because fitness is based on revealed comparative advantage, which is a relative measure, if the fitness of one group of countries is improving, the fitness of other countries must be falling.

In the latest period, the UK has a fitness level and ranking below that of Germany, France and Italy. Over the period shown in the two charts, however, it appears to have followed a similar fitness path to other European countries. This might appear to be reassuring, but further analysis shows this is not the case.

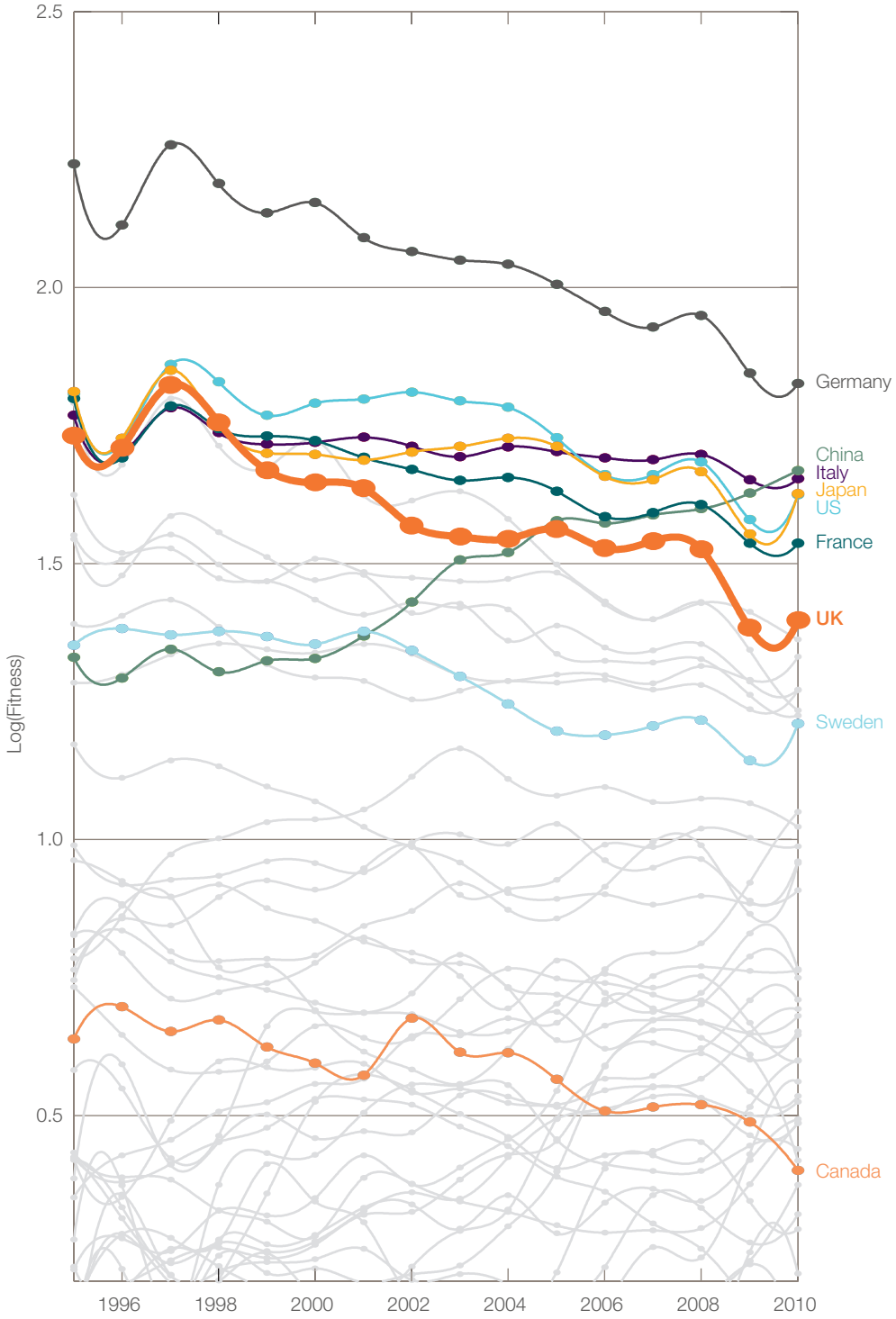
Deeper analysis reveals fragility in the UK position that is not evident from the fitness calculations alone. The range of a country's exports can be measured on a spectrograph. As with figure 3.8 above, goods are represented on the x-axis in increasing order of complexity, with basic materials at the left-hand end and complex finished manufactured goods on the right. The heights of the bars represent the importance of each product in a country's export mix. An emerging economy, or an advanced one that is heavily reliant on natural resources for its exports (such as Canada for example) will have a spectrograph with peaks that are concentrated towards the left-hand side of the graph; a highly advanced economy with few natural resources (such as Japan) will have its peaks concentrated in the right-hand half.[18] A well-diversified economy will have fewer peaks and troughs, indicating export strength across the whole spectrum of complexity. Germany is a good example of such an economy.

16 So far, this analysis has only been applied to trade in goods, not services. Although this might seem to be a constraint for a country like the UK, which has seen the share of services in its exports increase substantially at the expense of goods, the underlying argument is that diversity is an advantage. If the UK is to improve its trade position, it needs to address, and preferably reverse, the relative decline in the export of goods. This analysis can help us understand how that might happen.

17 Details of the methodology, which involves non-linear algorithms, are set out clearly – albeit in rather technical language – in Cristelli et al 2013.

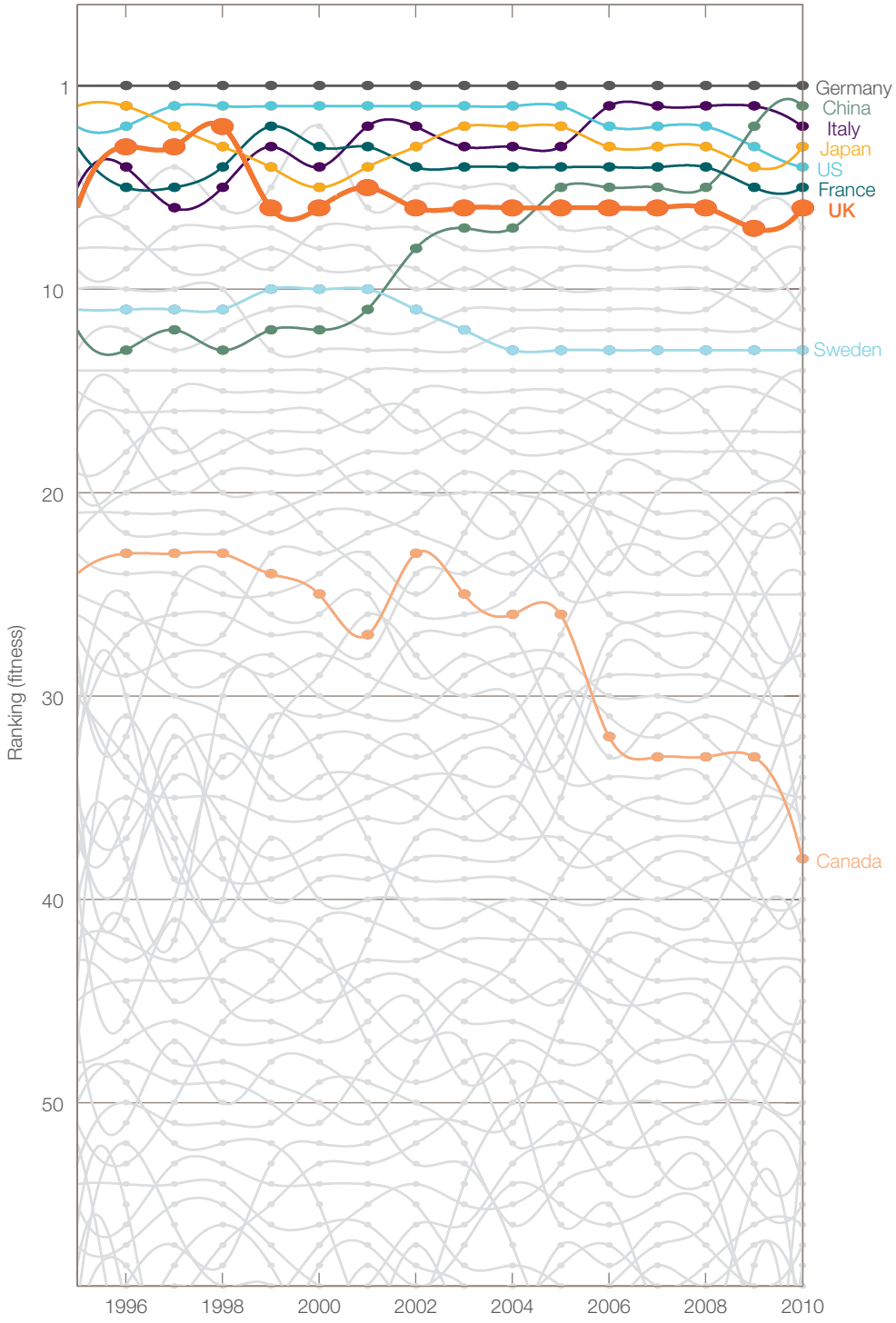
18 Spectrographs for Japan and Canada can be found in appendix 2.

Figure 3.9
Trends in economic fitness level, UK and selected other countries, 1995–2010



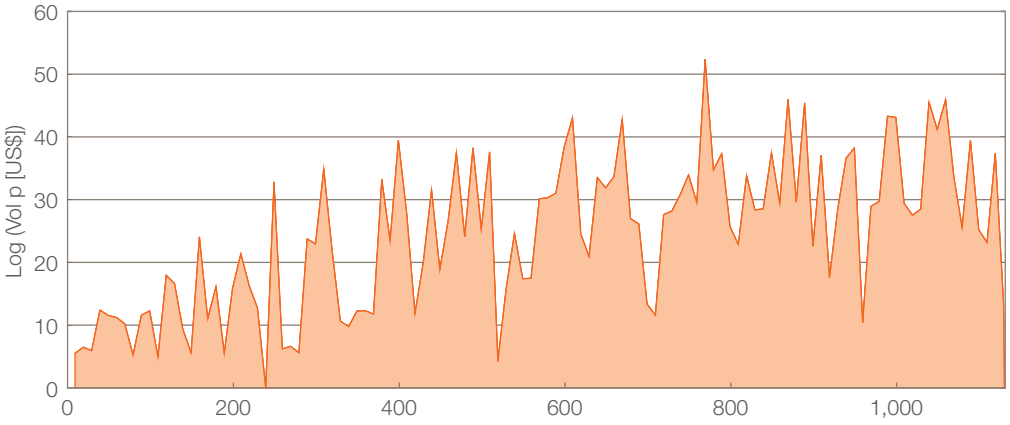
Source: Research by Riccardo Di Clemente in collaboration with members of Professor Pietronero's team

Figure 3.10
Trends in economic fitness ranking, UK and selected other countries, 1995–2010



Source: Research by Riccardo Di Clemente in collaboration with members of Professor Pietronero's team

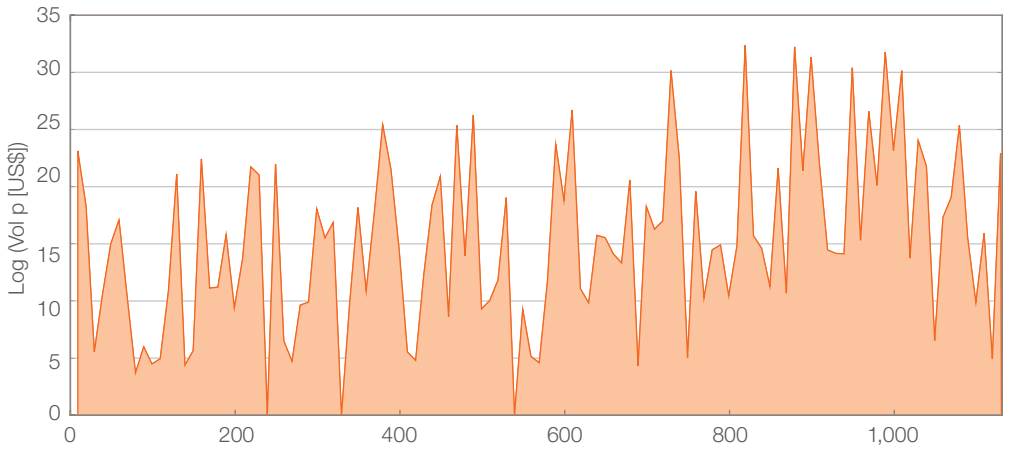
Figure 3.11
Spectrograph of German exports, 2010



Source: Research by Riccardo Di Clemente in collaboration with members of Professor Pietronero's team

The UK's spectrograph shows peaks across the full range of complexity, indicating that the UK has some strengths in the markets for both low-complexity and high-complexity products. As well as these peaks, however, there are also many troughs. This highlights a lack of diversity in the UK's exports compared to similar countries. The UK exports some low-complexity and some high-complexity products, but not as many in either group as a country like Germany. The contrast with Germany, which has a very well-diversified export basket, confirms the hypothesis that successful export economies (Germany has had persistent large trade surpluses for many years) do not specialise but instead diversify. The UK's exports are also, on average, less complex than those of other large European countries, including Germany, France and Italy.

Figure 3.12
Spectrograph of UK exports, 2010



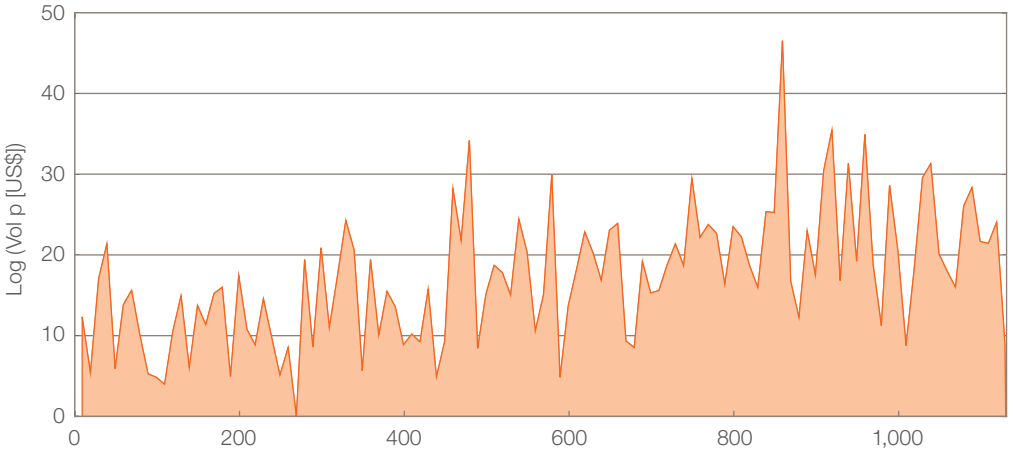
Source: Research by Riccardo Di Clemente in collaboration with members of Professor Pietronero's team

Although this analysis is confined to exports of goods, the analysis of revealed comparative advantage presented earlier suggests that the picture would not change if it was extended to include services. The UK's reliance on exports of

financial services is just another dimension of the relative narrowness of its exports. By following a Ricardian approach of specialising in the export of financial and other business services and a narrow range of goods, the UK has performed poorly.

As an additional point of concern, further analysis shows that the UK's export basket has become less diverse and less complex over recent years. In 2010, the UK had an revealed comparative advantage in fewer goods than in 1985, and the average good in which it had an advantage was less complex than it had been 15 years earlier.

Figure 3.13
Spectrograph of UK exports, 1995

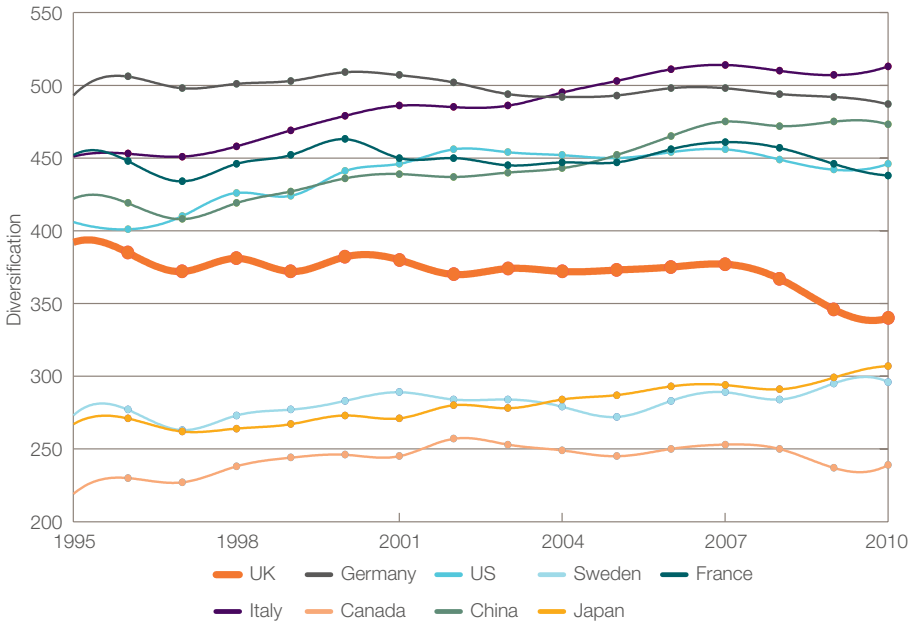


Source: Research by Riccardo Di Clemente in collaboration with members of Professor Pietronero's team

Closer analysis shows that the UK experienced a large loss of diversification and competitiveness (in relative terms) between 2007 and 2009, indicating that its export sector proved to be very vulnerable in the recession (see figure 3.14). This is particularly worrying because the analysis is confined to the goods sector and the UK's exports of services were badly hit at the same time. Because the last recession was caused by a financial crisis, it was accompanied by a large contraction in global financial activity – a sector in which the UK is a major international player. The diversification of the UK's goods export sector declined at the same time as its major exporting service sector was badly hit. This goes some way towards explaining the failure of exports and the current account deficit to respond to the sharp decline in the value of sterling in that 2007–2009 window.

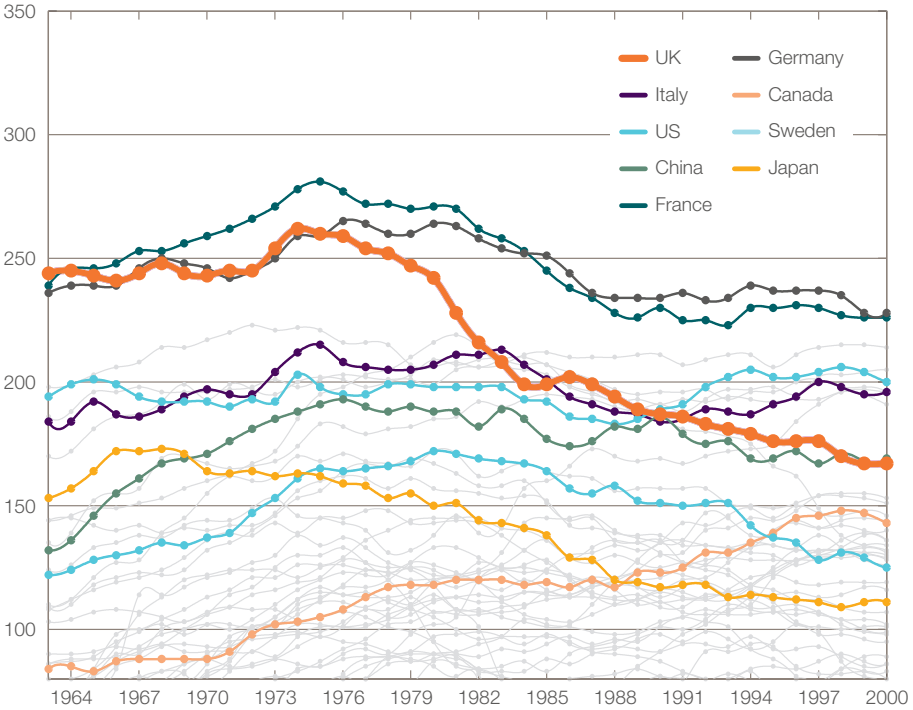
The picture in the decades prior to 1995 is even less favourable for the UK. The same database used to create figure 3.14 also contains information for the years 1963 to 2000, but arranged by a different set of categorisations (so results are not directly comparable with those for later years). Figure 3.15 shows the fitness level of the UK compared to other countries from 1963 to 2000. From 1974 until 2000 there is an almost unbroken fall in the UK's diversification level, with a particularly steep drop between 1980 and 1984. Although other countries, including Germany and France, saw their diversification levels fall during this period, none experienced the scale and persistence of the fall in the UK.

Figure 3.14
Trends in export diversification (number of RCAs)



Source: Research by Riccardo Di Clemente in collaboration with members of Professor Pietronero's team
Note: Export diversification represents the number of products in which countries have a revealed comparative advantage, out of a total of 1,131.

Figure 3.15
Trends in economic fitness level, UK and selected other countries, 1963–2000



Source: Research by Riccardo Di Clemente in collaboration with members of Professor Pietronero's team

3.4 Implications for policy

An uncomfortable picture emerges from this analysis of the UK's structural economic competitiveness and 'fitness' relative to comparable economies. While countries like the US and Germany have expanded the number and complexity of the products that they make, and other countries like France have held their positions, the UK appears to be retreating: decreasing the variety of things it makes and becoming less competitive in a number of sectors. Between 1995 and 2010, our economy became less competitive in about 140 sectors, while gaining it in only around 70, suggesting that its capabilities for future growth have declined.

The only other developed countries that have experienced a similar 'hollowing out' are Canada and Norway – economies suffering 'Dutch disease', specifically where a high exchange rate associated with exports of a natural resource has resulted in a loss of competitiveness in other areas of the economy. Our hypothesis, as noted previously in section 2.3, is that the UK is suffering from its own variant of Dutch disease, but instead of a natural resource – such as oil, in the case of Norway – the UK's problem is the dominance of its finance industry. Capital flows into finance since the 'big bang' have kept sterling's exchange rate high, hurting the competitiveness of the rest of the economy and accelerating the decline in manufacturing.

It is not all bad news; there are some industries or sectors where the UK is competitive in global markets and has a significant cluster of activity: aerospace manufacturing, pharmaceuticals and oil and gas are strengths, and automobile manufacturing is on the cusp of being one. However, in many cases, these strengths are based on the decisions of a small number of large global companies to base significant activities in Britain, rather than the diverse, multi-scaled thicket of activity seen in, say, Germany. This creates fragility. Anything that might make Britain a less attractive place for global big businesses to set up activity – such as exit from the European Union, higher taxes, a decline in infrastructure, or restrictions on immigration – would undermine these strengths.

A related problem is the weakness of the UK's '*Mittelstand*' companies. These companies increase the diversity of the product and capability space in countries like Germany, and to a lesser extent the US and France. Analysis suggests the global competitiveness of the UK's large publicly listed companies is good but narrowly focused in a few key sectors and parts of the value chain. There is a lack of breadth in the UK economy and a lack of a well-connected ecosystem between large and medium-sized firms.

The lack of diversity in the UK's exports will make it hard for the UK to increase its share in global markets in a sustainable way.[19] But the alternative – continuing to focus on a relatively narrow range of strengths and accepting the vulnerability of such an 'eggs all in one basket' approach – is not really an option. The UK has to take on the tougher task of developing new capabilities and export strengths. This is best done by looking for goods that require similar capabilities to produce as goods that are already successfully produced. This way the UK can slowly expand the range of goods that it counts as export strengths – that is, it can fill in some of the troughs on its spectrograph (as in figure 3.12).

The role of industrial clusters will be crucial if the UK is to successfully implement such a strategy. They represent proven areas of competitive advantage that are using capabilities already present in the economy. Furthermore, they are ideally placed to utilise those capabilities – and to develop new ones – to enable the cluster, and thus the UK, to widen its scope. Innovation, in particular, will be crucial, particularly if it is aimed at developing the capabilities needed to produce new goods. Only by adopting this approach, this new focus, will the UK be able to develop the broader range of export strengths it needs to improve its trade performance.

19 For a similar analysis of the Swedish economy, which concludes that Sweden has a 'healthy diversity', see Alsén et al 2013.

4.
CLUSTERS AND WHY THE UK NEEDS THEM

4.1 What are clusters?

Most definitions of industrial clusters derive from Michael Porter's seminal work *The Competitive Advantage of Nations*. Porter describes clusters as 'geographic concentrations of interconnected companies and institutions in a particular field' (Porter 1990). For the next decade and more, the idea of close geographical proximity was prominent in writings about clusters. At the turn of the century, the Department of Trade and Industry adopted a definition of clusters that described them as groups of inter-related firms that were linked in some capacity and that had to be in close proximity to each other (DTI 2000). In 2012, the Department for Business, Innovation and Skills (BIS) was still referring to clusters as 'geographic concentrations of inter-connected companies, specialised suppliers, service providers, firms in related industries and associated institutions (for example universities, standards agencies and trade associations)' (BIS 2012).

Geographical proximity is seen as a key characteristic of successful clusters for a number of reasons. Primarily, it is argued that proximity will lead to the development of strong networks, which increase the beneficial spill-over of knowledge (Andersson et al 2004). Networking and intense cooperation between firms and institutions are seen as important features. Close networks are a form of social glue; they operate through a series of relationships between firms and people. This activity generates positive technological and knowledge spill-overs and gives rise to innovation and therefore greater competition. In some circumstances, colocation can also make it easier for firms to achieve economies of scale and to increase their access to markets and suppliers (EC 2008).

Changes in the industrial structure of developed economies are altering the nature of clusters. Traditionally, most clusters were found in manufacturing and were centred on sources of raw materials, energy supplies and strong transport links. Steel production, for example, would tend to be located close to supplies of iron ore, coal and water. There are now new types of cluster that extend beyond the world of production and manufacturing. These include innovation-led clusters that are heavily based on science and technology. They make use of innovation, R&D and networks in different ways to traditional clusters. London's 'Tech City' is a prominent recent example, but clusters have long existed in the service sector. Arguably, the financial services industries and all the related activities that together comprise 'the City' are the most successful example of a cluster in the UK.

Clusters are not limited to a single industry. Suppliers of specialised inputs, public and other institutional bodies such as universities and trade associations and even parts of government can all be found within different clusters. It is the interaction and partnerships between different industries and institutions that boost the competitive performance of a cluster (Porter 2000). Clusters can be large, connecting a number of industries and institutions, or smaller. They can be horizontal – linking industries that share a common market for products and have similar sets of skills, technologies or other resources – or they can be vertical – extending up and down a supply chain to buyers or customers. Or they can be both at the same time (ibid).

Ann Markusen (1996) identifies four main types of cluster:

1. **Marshallian** clusters: These are predominantly made up of small and medium-sized firms that are craft-based, high-tech or producer services industries. Within these clusters there is a large amount of trade between firms. There is a lot of cooperation and interaction within the cluster to improve overall competitive performance.
2. **Hub-and-spoke** clusters: These typically comprise a small number of firms (sometimes only one) that support many smaller firms and related activities. The smaller firms may develop in the cluster as part of the value chain or to access benefits related to the anchor firm's presence. Often, cooperation is between the small firms and the large firm, rather than between the small firms, which compete with each other.
3. **State-anchored** clusters: These are defined by the central role of a public or non-profit body, such as a university, which plays a major part in stimulating regional business activity.
4. **Satellite** platforms: These are typically clusters that are branch facilities of an externally based multiplant firm. Little spin-off activity is generated in these clusters, and plants often operate independently, with no significant networking or cooperation occurring between branches.

4.2 New thinking about the connectivity of firms

It has been recognised for some time that in the modern economy clusters can extend beyond geographical boundaries, in certain circumstances (Kuah 2002). The reduced importance of geographical proximity is largely driven by technological advances and the integration of markets across national borders (OECD 2007). Technological innovations, and the internet in particular, have greatly reduced transaction costs (primarily communication and transport costs), in turn lowering the importance of colocation or geographical concentration. This has led some economists to think about clusters in new ways.

The starting point for new economic thinking about clusters is the realisation that there is a high degree of connectivity between firms within the same industry, and between firms in different industries. A study of input–output data for 123 industries in the UK found that most firms require inputs from firms in other industries, and most sell their products to firms in other industries (Caiado and Ormerod 2012). In some instances, this connectivity does not create a cluster: utility firms, for instance, supply electricity to every firm in every industry in the UK (bar perhaps a few that generate their own) but could not be described as being in a cluster with the vast majority of them. On the other hand, a firm supplying tyres and a car assembler are very likely to share a cluster.

Economists have become proficient at identifying clusters through recognising the agglomeration of firms that are in some way complementary. They also understand the benefits they bring. However, they are less good at understanding how clusters start and develop. What has been missing from the analysis of clusters is recognition of the importance of the role of the firm (Best 2005). Firms are the drivers of technological change, the employers and trainers of the cluster's workforce, and hence its skills base, and guardians of its technological know-how. It is all these capabilities, gathered together by firms, that give a cluster its competitive advantage. As firms in a cluster grow and innovate and new firms are attracted in, the capabilities of the cluster evolve and expand.

Building on this insight, Ricardo Hausmann and Cesar Hidalgo have developed new ways of mapping the links between firms. They use their analysis to understand the strengths of economies, why they make what they make, and why they have the particular set of capabilities that allows them to do so (Hausmann et al 2011).

They see economies as collections of capabilities that can be combined in different ways to produce a set of products and services. Some of these capabilities can be directly observed – the number of people with a PhD in molecular biology, or the patent to produce a particular drug – but many cannot. Therefore, they look at production data, and export data in particular, and map what a country does. From this it is possible to infer the mix of that country's complementary capabilities.

Understanding what capabilities a country has assembled to produce a particular set of products is a necessary step to being able to define what other capabilities it could develop, and therefore what other products it could be making. From this view, growing a country's productive potential requires recombining existing skills and capabilities in new ways and adding new skills and capabilities. In most cases, this will require collaboration between the private and public sectors to stimulate new industries, and it will only happen slowly, with new industries developing from existing ones.

Hausmann, Hildago and their colleagues do not think about clusters in the traditional, spatial sense. Instead they think in terms of a product map. They map the 'product space' using circles to represent different products (ibid).[20] The closer the circles are together, the more they are exported by the same countries, suggesting that similar capabilities are involved in their production. An economy that is strong in these areas has good prospects of expanding its production possibilities. On the other hand, an economy that operates on the outer edges of the product space, where industries are further apart, will find growing in new areas more of a challenge. On this kind of map, products that require unique capabilities (a particular natural resource, for example) are plotted far from other products, while those that are closely related in terms of the capabilities needed to produce them (say, similar types of manufactured products) are found close together. In many cases, the latter might also be found to be geographically clustered too.

Beyond this map, Hausmann, Hildago and colleagues also distinguish between complex products – those that require a lot of knowledge or a diverse range of capabilities to produce them – and less complex products; and they define a complex economy as one that produces lots of complex products. The emergence of new competitors in the global economy has made it imperative for advanced economies to become more complex (as discussed in section 3.3). If they do not, they are likely to be less competitive and less stable, and have lower productivity and real incomes. Complex economies are characterised by a well-educated workforce, the promotion of innovation and a high degree of competition. Policy should focus on developing these institutions.

Advanced countries – which are already operating at the production frontier and so cannot grow by copying technologies from other countries – have to grow by innovating and developing new capabilities or by recombining existing capabilities in new ways. New capabilities are easier to acquire if they can be combined with existing capabilities to make new products, which makes it more likely that countries will move into the production of products that use at least some of the capabilities that are already available. This has important implications for deciding which sectors of the economy to support through industrial policies.

Although their analysis is based on export data, Hausmann et al (2011) have demonstrated that the economic complexity of a country is not just related to its trade performance or to the contribution of exports to growth: economic complexity is also reflected in the overall level of a country's income. A country's income per head and its potential for future growth tend to be directly related to its degree of economic complexity: the amount of 'product knowledge' that it has accumulated,

20 For examples, see http://kellogg.nd.edu/students/grad/hidalgo.shtml

or the sum of its capabilities. Economic policies should support the development of these capabilities, and can most effectively do so by supporting industrial clusters.

4.3 How do clusters emerge?

Historically, the formation of clusters – industrial agglomeration in a local area – was often the direct result of access to natural resources or key markets. For traditional clusters that rely on natural resources – such as the oil and gas cluster in Aberdeen – the location of production inputs will always be the crucial factor in their formation and development.

For many modern or non-traditional clusters, location remains important. Sometimes it is proximity to a research centre or to an innovative company that spurs the creation of a cluster. In particular, universities and public research institutions are often the starting point for the formation of a local cluster (Garnsey 1998). Research institutions generate new knowledge and are associated with a large skilled workforce, so they attract entrepreneurs. They become important partners and sources of resources for firms within clusters. Porter (1998) cites the examples of clusters in Massachusetts around MIT and Harvard and of innovative companies in Minneapolis that led to the creation of a medical device cluster. In the UK, the technology cluster around Cambridge University is a prime example of the enduring importance of location.

However, for many industrial clusters the presence of a university or research institute is only one of a number of prerequisites. Following a meta-analysis of 159 clusters, Thomas Brenner and André Mühlig (2007) identify a number of other factors which might be required for the emergence of a cluster, noting that their importance varies from case to case. These include the existence of qualified labour, with strong networks between workers (networks were cited as an important factor in 78 out of 159 cases); regional tradition and historical preconditions (in 66 cases); existing industrial structure (61 cases); and local policies (56 cases). In addition to these factors, a triggering event might also be required – which could range from a war to a new innovation – to spur the emergence of a cluster (EC 2008).

In other cases, a cluster might form seemingly by accident. In 2012, the *Economist* explained how an unmanned aerial vehicles (UAV) cluster became established in west Wales after plans to develop an airport for private planes fell through due to lack of demand. The airport's owner, with backing from the Welsh Assembly, was able to turn the airport into a centre of excellence for the development of UAVs, and in doing so attracted a number of other companies to the area (Economist 2012). Similarly, the semiconductor design cluster in the south-west of England grew out of a failed attempt to create a British-owned semiconductor industry. Although the semiconductor production firm that was set up was sold, many of the engineers that it had formerly employed stayed in the area and started up their own small businesses. They were able to attract inward investment and there are now over 100 companies in what is among the largest clusters of its type in Europe (BIS 2011).

4.4 Clusters as drivers of growth

Seeing the economy through this lens provides a better understanding of its development than the input–output relationships used in traditional growth models. Clusters highlight the importance of interdependencies between firms, institutions, government and people. They allow the economy to be understood as a series of collaborations and networks. In clusters, competition and cooperation coexist because 'they occur on different dimensions and among different players' (Porter 1998: 79). It is not individual firms or industries that are the primary source of growth in output and jobs in a region, but the agglomeration of similar industries within that region (Waits 2000). It is this agglomeration of industries that increases

a cluster's competitive advantage and the competitive advantage of the region. The implication is that any growth strategy (or industrial policy) should favour the development of localised concentrations of industries and firms.

Clusters are associated with higher levels of competitiveness and growth. The statistical evidence shows that the presence of clusters is correlated with increased prosperity for a region (EC 2012: 178). In particular, clusters foster more innovation because technological knowledge is able to spread far more quickly within their tight-knit networks (DTI 2001).

> *'[Clusters] reflect the dynamic process of innovation found today. Clusters allow for flows of tacit knowledge between various parts of a network. It is these interactions that ultimately give rise to innovation.'*
> EC 2010

These transfers of knowledge can lead to greater productivity gains for industries within a given cluster, enabling firms to remain competitive in an increasingly globalised economy (Feser 2001).

Innovation and the sharing of knowledge are not the only reasons why clusters are associated with higher levels of productivity. They also offer easier access to specialised inputs and skilled workers, lowering the search and transaction costs associated with hiring staff (Meyer-Stamer and Harmes-Liedtke 2005). Other factors that can reduce costs for firms are common purchasing from suppliers and greater access to public goods and services (Porter 1998).

The success of a cluster can become self-feeding. Innovation and higher productivity are likely to lead to increasing returns, which will attract new firms to the cluster and lead to firm expansion. The expansion of the cluster will stimulate competition, improve productivity and lead to even greater growth. New businesses will also emerge in clusters to take advantage of proximity to resources, skilled workers and established markets.

4.5 The role of cluster policies

Some economists do not see any role for policy to support clusters. Instead, they argue that clusters emerge and develop without any form of public assistance, and believe that the cooperation and collaboration within clusters that gives rise to positive externalities – such as knowledge spill-overs, economies of scale and reduced transaction costs – occur without any public assistance (see for example Potter and Miranda 2009). Other economists, however, have pointed out that examples of clusters that have succeeded with no government support are rare. The Economist Intelligence Unit, for example, says that many clusters have prospered on the back of intervention by government, and that no cluster has succeeded without some assistance, if only in the supply of a trained and educated workforce (EIU 2011). Others have argued that the US government did much to support Silicon Valley (OECD 2007, Mazzucato 2013).

There is, however, a strong consensus that governments should not try to create new clusters. An analysis of 733 clusters across 49 countries carried out by Claas van der Linde found only one that had formed as a direct result of government intervention (Van der Linde 2003). This suggests that governments should limit their policy interventions to promoting the development of existing clusters (DTI 2000). In particular, policies should be designed to boost innovation and growth and remove any barriers to the cluster's development (Porter 1998).

The positive benefits associated with clusters mean that there is a public interest in designing policies that accelerate and support emerging clusters, and possibly mature ones too. Firms in clusters tend to consider the role of the government in

promoting their activities as important (EC 2008). In particular, if it is accepted that clusters generate externalities – such as knowledge spill-overs or a highly skilled, possibly specialist workforce – then there is a rationale for policy intervention. Governments should provide funds to support the activities within clusters that create externalities, in particular innovation and workforce development (EC 2012). This is better than supporting individual firms, an approach which risks 'picking losers', but it is also an improvement on offering support only to the entire economy. The challenge is determining when and where to intervene, in what way and on what scale.

Most countries have at some time adopted policies to support industrial clusters. In 2005, over 1,400 cluster initiatives were identified by the Global Cluster Initiative Survey (EC 2008). In the UK in the early 2000s, the Department of Trade and Industry (DTI) actively promoted clusters as part of its regional growth strategy. It carried out a cluster mapping exercise, identifying key clusters to promote within given regions (Uyarra and Ramlogan 2012). At an international level, major organisations such as the OECD and the European Commission have also actively supported the promotion and understanding of clusters.

The European Commission has established a number of collaborative research programmes aimed at supporting clusters. These include the European Cluster Observatory, the European Cluster Alliance and the European Cluster Policy Group. These were set up as part of the response to the Lisbon Agenda (EC 2008), which aimed to make the European Union 'the most competitive and dynamic knowledge-based economy in the world capable of sustainable economic growth with more and better jobs and greater social cohesion'.[21] Clusters remain a part of the European Commission's strategy for promoting innovation and competitiveness within the EU.

The European Cluster Observatory

The European Cluster Observatory was launched in 2007 under the European Commission's Europe INNOVA initiative. Its purpose is to provide policymakers with a comprehensive source of information about clusters. It has mapped clusters using employment data across 36 countries, including all EU28 countries, and used its data to analyse regional competitiveness. The Observatory has also recorded cluster policies and supported a transnational cluster network in Europe.

So far the observatory has mapped over 2,000 regional clusters. It ranks each cluster with up to three stars according to the following criteria:

- the level of employment in a particular industry cluster within a region
- the degree of specialisation within a region
- the cluster focus of employment within a region.

Using this ranking, in 2010, it found 155 regional clusters that merited three stars (8 per cent of the total), 524 were ranked two-star clusters (25 per cent) and 1,338 were give one star (67 per cent) (EC 2010).

This initiative is designed to help policymakers better understand clusters and to facilitate evidence-led policymaking, so that countries can best support the emergence and growth of clusters and capture the potential benefits associated with them.

Although cluster policies have been implemented across many countries since the 1990s, there is no clear consensus on the best type of policy to support and develop clusters.

21 http://europa.eu/legislation_summaries/employment_and_social_policy/eu2020/growth_and_jobs/index_en.htm

In part, this is because policies need to be varied according to a number of factors (Uyarra and Ramlogan 2012):

- the objective – whether it is to promote innovation or boost regional growth and employment, for example
- the stage of the cluster – different policies are likely to be appropriate when supporting an emerging cluster as compared to a mature one
- the industrial sector – for instance high-tech innovation versus traditional manufacturing.

It is also difficult in some cases to identify particular policy initiatives as 'cluster policies'. Many policies that have more general aims – often falling under the broad heading of industrial policy and including, for example, regional and skills policies – have an effect on clusters. Hence, policy can be 'cluster-informed' (DTI 2000, Andersson et al 2004). There are, however, example of countries that have had a clear set of policies designed specifically to support clusters, including South Korea and the Netherlands (Uyarra and Ramlogan 2012).

4.6 Policy impact

Although cluster policies have been adopted in many OECD countries, there is little consensus on their effectiveness. Cluster policies involve a great deal of trial and error, which means there is a continual need for assessments of their effectiveness, to determine what works and what does not, and what needs to be modified. But evaluating cluster policies is hard. Policies are likely to be effective only over a period of several years and their effects might overlap with those of other policies. Furthermore, the intangible nature of some of their objectives or desired outcomes – such as increased knowledge exchange – makes their effects hard to measure and evaluate. There is also no counterfactual case, making it hard to determine whether a particular policy has had a direct impact on a particular outcome. Greater collaboration or the creation of new firms can, for example, be a result of many different factors not specific to cluster policy.

The starting point for any policy evaluation is to measure over a period of time a range of basic economic indicators associated with a supported cluster, including the number of firms, employment levels and sales and trade performance. In addition, evaluations focus on measures that capture the particular impact of a cluster: firm expansion, the creation of spin-offs and the number of new products generated as a result of partnerships and collaboration. Some statistical assessments have used 'control groups' (industries or regions that have not benefitted from support) to try to isolate the effects of cluster policies on the economy.

Despite the difficulties of doing so, some countries – including Japan and the US state of Georgia – have begun efforts to evaluate programmes, and the European Cluster Observatory has also collected data on the effectiveness of cluster initiatives. Japan's Industrial Cluster programme evaluated its own performance based on a number of factors, including the number of collaborative projects generated and how many businesses were set up as spin-offs from existing firms or academic institutions. The survey, carried out in 2005, found that two-fifths of companies started new collaborative projects and over half of companies launched new businesses. Furthermore, there is some evidence that the clusters programme has had an impact on broadening customer bases (OECD 2007). In a similar approach, the Georgia Research Alliance monitored its performance using a series of measures such as the number of top professors who have moved to the region, and the amount of training delivered to students. An external assessment of the programme found that the Alliance acted as a one of the catalysts in supporting science and technology related growth within the state.

The main problem with quantitative analysis is the lack of a counterfactual case: the difficulty of gauging what would have happened if there had been no policy initiative. Statistical analysis is therefore often complemented with surveys to determine participants' satisfaction with policies. Firms and other key actors within clusters are asked what has worked and where the government could provide greater support. The Europe-wide Innobarometer survey in 2006 took this approach. It revealed that firms wanted more public assistance to promote knowledge exchange, greater access to finance for carrying out particular projects, and greater support for particular administrative processes (EC 2008). Firms also called for additional supply-side measures, such as tax relief for some expenditure.

Another evaluation based on a qualitative approach was of the West Midlands automotive cluster. Thirty per cent of the key stakeholders who were interviewed identified collaborative activities as the main benefit from belonging to the cluster. Analysis of the responses also found that cluster policies boosted collaboration between firms, universities and other educational institutions from 16 per cent to 35 per cent, and that collaboration between firms and commercial laboratories or R&D enterprises increased threefold from 7 per cent to 20 per cent (Uyarra and Ramlogan 2012).

4.7 Potential pitfalls

A cluster is only beneficial to a region or a country while it retains its comparative advantage. Clusters must therefore remain as adaptable and flexible as possible and avoid overspecialising and introspective 'lock in'. Even then, there is a risk that changes in the global economy will permanently remove the rationale for a particular cluster to exist. China's growing interaction with the global economy during the last 20 or so years has, for example, removed the comparative advantages of many previously successful clusters in developed economies. Policymakers should not support clusters that have lost a comparative advantage, which risks not only wasting resources but also preventing necessary adaption in their economies.

Another potential pitfall is the temptation for regions to seek to foster clusters even though there are no local conditions or capabilities that justify doing so (Boekholt and Thuriaux 1999, Hospers et al 2008). It is a common mistake of policymakers to try to follow an easy route to cluster development and to support the same clusters across various regions without taking into consideration the context for each cluster (Andersson et al 2004).

Finally, clustering only makes sense to firms if the costs are outweighed by the potential benefits. If too many firms are attracted to a particular location, costs – in terms of rents and congestion, for example – can eventually rise to the point where the cluster is no longer attractive. High house prices deterring skilled labour might have the same effect.

4.8 The spatial concentration of industries in the UK

Clusters can comprise a number of firms in broadly the same industry, but more commonly they are made up of firms across a number of industries whose activities are complementary. In the UK, then, analysing the spatial concentration of industries is only a first approximation of where clusters might be found. Based on employment data by industry and location, at an aggregate level, the most concentrated industries in the UK are mining and quarrying; finance and insurance; information and communication; and professional, scientific and technical activities (Campos 2012).

At a more disaggregated level, there are a number of subsectors that are geographically concentrated. In some instances, this is because they are dominated by a small number of large firms. These industries have pockets of employment

in a few locations around the country, but they do not represent in any sense a cluster because employment in any area is concentrated in one firm. There are other subsectors, however, where genuine clusters are found: industries with a large number of firms that are located close to each other. These are found most frequently in the knowledge-intensive service sectors and in a range of supporting services and activities. The likelihood is that firms in these industries are clustering because of the benefits of networking, the existence of information spill-overs and access to a pool of talented workers.

Firms that are geographically concentrated tend to produce tradable goods and services or are vertically linked to firms that do so. A policy that seeks to boost the performance of the UK's export industries has therefore to be based on an understanding of clusters, the removal of barriers to their growth and their active promotion.

Celia Campos and Richard Prothero (2012) have extended this analysis to map the spatial concentration of industries across the UK. Their analysis shows:

- There are many industries with no spatial concentration because they serve local communities. Many of these industries are large employers – such as retailing, education and the health service – and they account for a majority of the workforce. These industries, for the most part, serve the domestic economy, so are not important for the UK's export performance (although parts of the hotel and restaurant industry do serve tourists).
- Some industries are spread widely across the country, but are found in clusters within regions. They represent a mix of domestic- and export-oriented industries. Utility industries are dominated by large firms that still need a regional presence or centre but not a very local one. For different, partly historical reasons the automotive industry displays a similar pattern.
- Other industries are largely confined to one part of the country, but are spread widely within that region. The information and communication industries, for example, are spread across London and the south-east in a 'dispersed cluster'.
- Some industries are very concentrated in a few local authorities. Finance and insurance services are good examples.

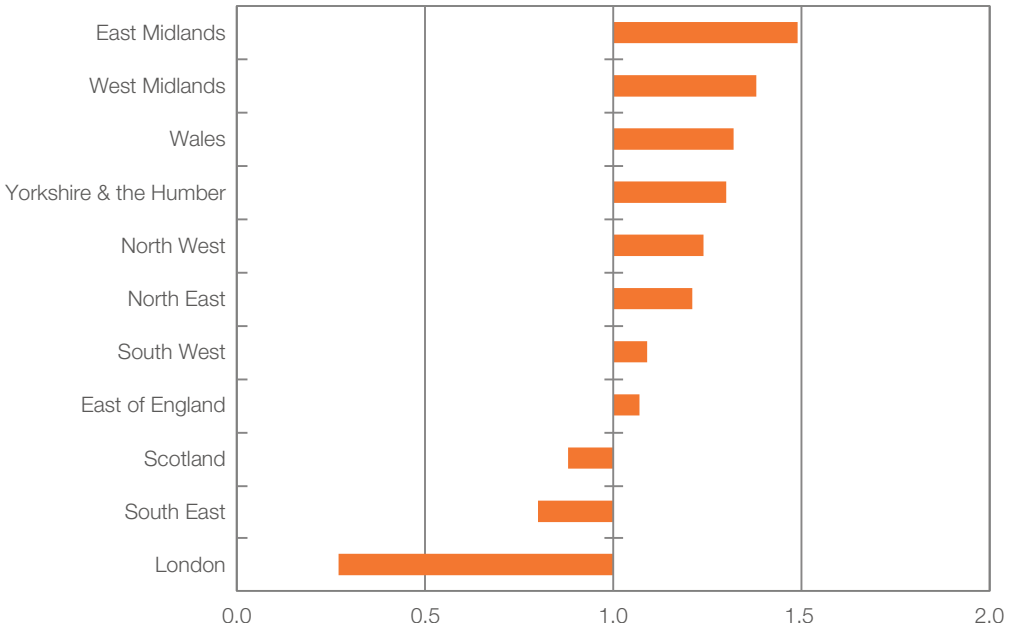
Campos and Prothero analyse spatial concentration through 'location quotients'. They measure the proportion of employees in a particular industry that are found in a region or local authority and compare it to the region's share in total national employment.[22] Their results for manufacturing are reproduced in figure 4.1.

Clearly, the Midlands, Wales and the north of England are the regions with the highest share of manufacturing jobs, relative to their national share. London has relatively little manufacturing activity.

Digging deeper, Campos and Prothero find that some manufacturing industries are characterised by wide dispersion across the country but tight concentration in particular areas. These include the manufacture of basic pharmaceutical products, metals, motor vehicles and other transport equipment. In most cases, this is explained by a high degree of industry concentration – that is, there are a few large firms dominating these industries, each centred in a different part of the country, with each cluster built around one large firm that attracts firms in other, related industries. Another group of manufacturing industries that also tend to be spatially concentrated is characterised by more and smaller firms. These clusters of small firms compete with each other in the same industry, but locate close together to exploit benefits such as a common pool of skilled workers.

22 For a comprehensive analysis of location quotients across England's local enterprise partnerships (LEPs) see Anyadike-Danes et al 2013.

Figure 4.1
Location quotients by region for the manufacturing sector



Source: Campos and Prothero (2012)

Britain has a long tradition of being host to clusters of all types, and not just in manufacturing. Some have evolved and survived in new forms (the City has its roots in London's dominance of the shipping insurance industry); some have declined as a result of technological change and globalisation (the Lancashire cotton industry) and some are relatively new (Tech City). A good set of cases studies can be found in the BCVA's *Tech Country* publication (Clark 2013). This covers the Cambridge technology cluster, gathered around the university (a state-anchored cluster, in Markusen's categorisation[23]); the Manchester life sciences cluster; the Bristol semiconductor cluster; the Midlands high-performance automotive cluster (a Marshallian cluster); and the Aberdeen oil and gas industry cluster (a hub-and-spoke cluster).

The distribution of clusters across the country is not even. Not everyone agrees on what comprises a cluster, so not every list of clusters is the same. BIS, for example, reckons there are 28 clusters of international importance in England. Of these, 14 are to be found in London and the South East region; none in the North East. The distribution of the 21 clusters of *national* importance that it identifies is more even, but still only one of these is based in the North East (BIS 2011). In a more recent report, the Centre for Cities and McKinsey and Company argue that there are 31 'economically significant clusters' in the UK, which together contain 8 per cent of the country's businesses and produce 20 per cent of its GVA (CfC 2014).

23 See section 4.1 for these definitions.

The West Midlands automotive industry

The UK has a long history of expertise in the automotive industry and much of this expertise is concentrated in the West Midlands region. The high concentration of automotive manufacturers, assemblers and suppliers within the region clearly comprises a cluster. However, despite being established and mature, the cluster faces a number of challenges in coming years.

The West Midlands automotive cluster is an important source of output, exports and employment for the region and for the UK. It is responsible for producing over a quarter of the UK's output of automobiles and components, contributes around 5 per cent to the region's GDP, and employs close to 115,000 people (Jarvis et al 2012). The region is host to a number of automotive producers, including major global manufacturers such as Jaguar Land Rover. It also has many suppliers – perhaps as many as 1,500 – including GKN and TRW, which provide a range of inputs required for the assembly of cars. Other related industries are also supported within the cluster.

The success and longevity of the West Midlands automotive cluster is due, in part, to active government support. In the early 2000s, the regional development agency, Advantage West Midlands, was given the task of supporting the automotive cluster and it provided funds to eligible firms to improve their business activities. The Premium Automotive Research and Development (PARD) programme was launched in 2003 by Advantage West Midlands and tailored to the automotive industry in the region. The £72 million programme had the aim of developing and improving the capability of the region's automotive suppliers, for example by working in collaboration with the region's universities, including the University of Warwick, to fully exploit its comparative advantage.

The West Midlands automotive industry now faces a number of challenges: the increasing globalisation of supply chains, for example, has led to the contraction of assembly and production lines in the UK (Donnelly et al 2012). There have also been legislative changes to reduce emission levels that will affect the automotive industry and necessitate its restructuring.

Some of these challenges, particularly low-carbon emission targets and energy efficiency, can be reframed as opportunities – the chance for West Midlands producers to become global leaders in a new technology. The UK's expertise in the automotive industry means it is well-placed to become a global leader in electric vehicle manufacturing, and the West Midlands has already been identified as having expertise in the production of low-carbon vehicles because a lot of the necessary infrastructure is already in place. As a result, there have been a number of programmes to support low-carbon vehicle development in the region, including the Low Carbon Vehicle Technology Project, which came to an end in 2011. More recently, the European Regional Development Fund announced an initiative to support companies based in the West Midlands that are looking to pursue low-carbon technologies. This scheme, the Niche Innovation Scheme, will provide grants of between £4,000 and £20,000 to West Midlands SMEs towards R&D for products that will lower the carbon emissions of vehicles (see Coventry University 2012). These projects aim to encourage innovation through collaboration between firms and R&D organisations.

The West Midlands automotive industry remains a successful cluster, but its recent history illustrates how a cluster and the firms within it cannot stand still. A comparative advantage has to be defended by innovation and adaptation – a cluster that fails to evolve is likely to go into permanent decline.

5.
POLICIES TO SUPPORT CLUSTERS AND BOOST EXPORTS

5.1 Policy aims

This report has shown that, compared to countries that are similar in other respects, the UK has relatively few areas of export strength and an overreliance on the financial sector when it comes to competing in global markets. The UK has been on a long path of deindustrialisation and retreat from various sectors, resulting in a loss of capabilities – more so than other comparable countries. This has happened across Conservative, Labour and now Coalition governments, and the result has been unbalanced economic growth and a persistent current account deficit.

To reverse this trend, the UK needs to raise its performance across sectors and subsectors where it performs poorly in global markets, and to develop new capabilities and additional export strengths. However, if we try to compete with emerging economies in low-productivity, low-value-added activities, real wages will stagnate – or even fall – and the economy will enter a structural decline. Instead, the UK needs to participate in what David Sainsbury has called a 'race to the top': moving into more high-productivity, high-valued activities (Sainsbury 2013). Backing industrial clusters should be a big part of such a strategy. Clusters generate productivity advantages that support relatively high-wage centres. They are also hard to replicate in other countries and so inhibit competition from lower-paying rivals (Crafts and Wolf 2013).

Throughout its period of deindustrialisation, Britain has had a less active industrial policy than its major competitors; this approach needs to be reversed. A new set of active industrial policies is needed to help build a healthier British industrial ecosystem. Clusters of industries where the UK could have a bigger global presence should be identified, and industrial policies, in particular on innovation and skills, should be focussed on specific support for developing them. Government cannot decree which products UK firms should produce but, by backing firms in clusters, which are hotbeds of innovation, it is more likely to boost the overall level of development of new products.

A primary aim of the country's industrial strategy should be to increase productivity levels in the export sector of the economy. Not only is this the best way to improve competitiveness and so begin to reduce the country's current account deficit; it will also lead to higher real incomes across the economy. By adopting industry-specific or cluster-specific policies, government can help to build a more resilient and export-oriented economy (McDonald et al 2012).

5.2 Industrial policies

Industrial policies are 'strategies to provide the specific inputs that markets need in order to foster the structural transformation that drives economic development' (Hausmann and Rodrik 2006). In other words, they should ensure that there are sufficient qualified workers, infrastructure and finance available for firms, support them in their efforts to innovate and encourage high levels of investment. If all these factors come together, then productivity and output growth will be strong and the economy will be competitive in global markets. However, if these inputs are not being provided by the market, there is no signal to tell government exactly

which inputs to provide. One solution to this dilemma is to adopt purely 'horizontal' policies: providing inputs to the whole economy, with the risk that some inputs will be overprovided and others underprovided. An alternative approach is to provide specific inputs to individual firms based on an assessment of which are the 'best' ones to back. At its worse, this can lead to 'picking losers' – backing firms that are no longer competitive and are very unlikely ever to be so again – as happened in the UK in the 1970s.

In recent decades, UK governments have shown a strong preference for 'horizontal' policies. Successive governments have approached industrial policy from the perspective of boosting the five drivers of productivity: skills, investment, innovation, enterprise and competition.[24] For the most part, they have supported these drivers across all industries, rather than focus on particular sectors or firms. Since the perceived failure of industrial policies in the 1970s, industrial strategy has primarily been sector-neutral and has avoided seeking to 'pick winners'. By definition, this approach does not lend itself to support for specific industrial clusters. However, at times, governments have supported selected sectors, including the automotive industry (by facilitating Japanese inward investment), the financial industry (with 'big bang' reforms) and the knowledge economy in the 1990s. In the early 2000s, the DTI told regional development agencies (RDAs) to focus on clusters as a way to stimulate regional growth. Each RDA was required to evaluate and assess clusters within its region and to put in place a strategy to develop them in ways that would boost employment, generate greater investment and encourage the formation of new firms.

Clusters and the regions

The UK economy needs to be geographically rebalanced, with a shift of emphasis away from London and the south-east. Growth in the regions over the last few decades has lagged behind that in London and the south-east because these areas have proved better at adapting to the pressures of globalisation and rapid technological change. Firms have been willing to invest in these regions, but have not done so in the rest of the country on a scale sufficient to offset the negative effects of structural change. IPPR North's Northern Economic Futures Commission set out many ideas to help reverse this trend (see IPPR North and NEFC 2012).

The analysis in this report is directed at solving a different rebalancing problem – making the UK economy more export-oriented – and it recommends doing so through backing industrial clusters. However, new capabilities are hard to acquire and new clusters cannot be created out of nothing by governments. Instead, policymakers should support existing clusters to deepen and broaden out, and encourage innovation that makes better use of the capabilities and strengths that already exist in the UK economy. However, this is likely to hinder rather than help regional rebalancing. According to the Centre for Cities and McKinsey, nine of the UK's 31 clusters are located in London and the South East region (including the largest five in terms of GVA), compared to two in the North West and just one in the North East (CfC 2014).

It is widely assumed that, because regional and growth imbalances in the UK economy developed at the same time, rebalancing the economy from consumption to exports and investment will lead to stronger growth in the regions compared to London and the south-east and so to a reduction in regional imbalances. This is not necessarily the case. Improving the UK's economic performance will not be achieved by going back to doing the things that we did 30 or more years ago, things that were strengths for the regions at that time. Instead, it will require developing new capabilities and strengths, which might or might not be located in the regions.

24 The 'five drivers' approach was stated explicitly in a HM Treasury paper from 2000, *Productivity in the UK: The Evidence and the Government's Approach*, but it was implicit in policies adopted throughout most of the preceding two decades.

RDAs no longer exist (replaced by local enterprise partnerships, or LEPs) but that should not mean the end of policy support for clusters. Given the benefits associated with them, the government should adopt a more active industrial policy that explicitly backs clusters – in particular those that have the greatest potential to develop or increase a comparative advantage. This would help to rebalance the economy, while creating internationally competitive industries.

How to support a cluster: the creative industries

In recent years, the creative industries have become an increasingly significant part of the UK economy and labour market. They are growing faster than any other sector (except real estate) and are a significant comparative advantage for the UK. Any 'march of the makers', to use George Osborne's term, should recognise and include the creative industries as 'modern makers'.

However, despite their strong performance in domestic and global markets, the creative industries have been largely overlooked in the government's efforts to devise an industrial strategy focussed on the UK's industrial strengths. This is a mistake. With government support, the creative industries could be doing even better. Action is needed in a number of areas: the role of a British Investment bank, the BBC's commissioning policies, the scope of tax reliefs, copyright law, digital infrastructure, workforce development and training, regional support and export promotion.

As a source of high-skilled, high-value-added jobs, the creative industries represent an opportunity for Britain to develop its capabilities and meet global demand for creative content. They also represent an opportunity to support growth outside London and the south-east by further developing the numerous creative centres, or clusters, that exist across the country.

Source: Straw and Warner 2014

Adopting a more active industrial strategy targeted on clusters in particular would not mean abandoning the five drivers of productivity. But it would mean acknowledging that they ignore the interdependencies and collaborative interactions that are crucial for innovation and productivity gains, and which define clusters. A new industrial policy should be more openly sector-specific and should actively support collaboration and partnerships. Although all clusters have similar types of need – help to strengthen networks, backing for innovation, finance, support to fill skills gaps – the precise mix and details of what is required varies from one to the next. Clusters are heterogeneous. They develop in different ways and look very different when mature. There is no one simple set of policy prescriptions that will work in every circumstance. Specific actions need to be taken to support individual clusters.

An industrial strategy that focusses on clusters would be a strategic departure from the approach of the last three decades, when growth has been promoted mainly through horizontal policies. But it would not be a return to the 1970s industrial strategy of propping up losers; nor would it mean picking winners, in terms of individual firms. Instead, support would be given to entire clusters, which are likely to include firms from a number of industries and other institutions. Crucially, the market, not government, will still decide which firms are successful within any cluster.

Policy should foster networks, strengthen collaboration, and improve the competitiveness of entire clusters rather than investing in single firms or industries. It should steer clear of attempts to create new clusters, but rather identify existing clusters where there is a recognised competitive advantage or the potential to develop one. This approach would not back declining sectors and industries, a defensive approach that often defined industrial policy in the first half of the 1970s. Instead, it would support emerging industries or high-tech clusters that have potential strong competitive advantages that are yet to be fully exploited.

How to support a cluster: ultra-low-emission vehicles

Tightened international standards for vehicle emissions have spurred the growth of a global market for ultra-low-emission vehicles (ULEVs), leading to the development of new technologies for hybrid and pure electric vehicles. Britain, with its strength in the automotive industry, is potentially well-placed to be a leading player in this new market. Many of the capabilities needed to produce petrol and diesel engine cars are transferable to the production of hybrid and electric vehicles. However, additional capabilities are required, and government and industry will need to act together to ensure that they are available. Only by doing so will they develop a comparative advantage for the UK in the growing ULEV market.

Action is needed in three specific areas of industrial policy:

- To ensure firms in the automotive supply chain have access to the finance they need.
- To provide greater public investment for the application and commercialisation of innovation.
- To adopt strategies in higher education, apprenticeship and migration policy that will ensure the supply of engineers and technicians is sufficient to match demand from the automotive industry.

In addition, the UK needs to develop quickly a strong domestic market for ULEVs, since foreign investors need a domestic market if they are to justify remaining in the UK. There are a number of things the government can do to facilitate this:

- Purchase incentives currently provided by government should be more actively promoted and guaranteed for longer periods to reduce uncertainty for buyers.
- Current usage incentives, such as free parking spaces, should be expanded and new incentives, such as free toll-road use for ULEVs, introduced. A single 'green badge' scheme should be brought in to make it easier to identify qualifying vehicles.
- As a major procurer of vehicles, the government should phase in more stringent emission standards for its own fleet.
- All ULEV drivers should have access to safe charging point infrastructure for domestic and private business use.
- New, rapid-charging stations should be placed at locally identified strategic locations.
- The electricity network should be upgraded to meet additional demand from ULEVs.

Source: Straw and Rowney 2013

There are numerous areas where the government can make a difference: strengthening networks; promoting a culture of innovation; ensuring firms in clusters are able to recruit the skilled workers they need domestically, and if necessary from abroad; removing barriers to competition, so that the strongest clusters and the strongest firms within clusters thrive, and removing barriers to entry to allow new firms to come in and challenge existing ones; and protecting intellectual property rights (EIU 2011). The research cited in chapter 4 suggests that three of these factors are likely to be crucial to the success of a cluster: strong networks; a high level of innovation; and a skilled workforce. The remainder of this chapter sets out some ideas as to what government could do in these areas to support clusters.

5.3 Strengthening networks

Even in a modern economy dominated by high-tech, service industries, colocation is crucial to many clusters. Proximity facilitates collaboration between firms and clusters with the strongest networks tend to be most successful (McDonald et al 2007). This creates a strong incentive for firms and institutions within clusters to strengthen their ecosystems but case studies of clusters and interviews with firms within them often find a degree of frustration at the narrowness and shallowness of network connections. There is a role for governments to play when it comes to fostering stronger networks.

Governments can act as a broker to encourage cooperation and interaction between firms to strengthen networks, for example by setting up networking events or conferences with the appropriate mix of academics, industry representatives and other relevant actors. Such efforts are often successful, leading to greater collaboration and enhanced competiveness. In the US, for example, the state of Oregon developed a network programme to facilitate collaboration in a number of industries and clusters that had formed across industry groupings (NGA 2002). The measures in this programme included implementing information campaigns, setting up network brokers and providing grants to facilitate network promotion.

In the UK, before they were abolished, one of the roles of RDAs was to create 'communities of practice' to support clusters. The South East England Development Agency set up an Enterprise Hub network, led by a number of entrepreneurs, to facilitate collaboration. The Hub offered incubator space for new businesses and access to venture capitalists, and was, in effect, a business club for networking. It also developed networks with research institutions by attempting to link each hub with a university research department (DTI 2000).

However, building the strongest networks requires more than providing a meeting space to bring people together, and there is a risk that collaboration between firms will come to an end if government funding stops. More permanent solutions are required. These could include 'cluster leadership teams' and a 'national cluster champion' (CfC 2014). Cluster leadership teams would be responsible for promoting the brand of a cluster, organising events, identifying mentoring opportunities, improving connectivity within the cluster, helping start-ups to access technical facilities, and identifying skills needs and working with local further education providers to fill them. The national cluster champion would coordinate the efforts of the cluster leadership teams, facilitate shared learning, and make the case to government for national policies to support the growth of clusters.

Like clusters themselves, networks cannot be created out of nothing. The strongest networks within clusters are likely to develop as a result of working in partnership or the delivery of joint projects. The government has a role to play through encouraging joint procurement bids and backing coordinated research activities.

In this respect, Innovate UK[25] takes credit for the creation of Catapult centres: 'physical centres for innovation that connect businesses with the UK's research and academic communities'.[26] Using public and business funding, Catapults have successfully brought together researchers and businesses to develop new ideas and to commercialise them. The business secretary, Vince Cable, has commissioned a review of Catapults. If, as seems likely, it confirms that they are working well, the government should commit to making them a permanent feature of the UK's industrial landscape. The length of time that it offers financial support to the existing centres should be extended, recognising that successful research requires a long-term commitment. The government should also back the establishment of more new Catapults, centred on areas of research excellence in Britain's universities. Increasing links between academia and businesses is the best way to support innovation, and there is an urgent need to develop as many new capabilities as possible. The expansion of Catapults could, if necessary, be funded with resources switched from R&D tax credits.

25 Innovate UK was, prior to August 2014, the Technology Strategy Board.

26 There are currently seven catapult centres: high-value manufacturing, cell therapy, offshore renewal energy, satellite applications, connected digital economy, future cities and transport systems. There are two more in the pipeline: diagnostics for stratified medicine and energy systems.

5.4 Promoting innovation

Innovation is crucial for economic growth and for increased competitiveness in global markets, particularly for more advanced economies. Innovation will be vital if the UK is to be successful in winning a bigger share of global markets so that it can reduce its current account deficit. The latest figures, though, are disappointing. In 2012, gross domestic expenditure on research and development in the UK fell by 3 per cent in real terms (that is, after allowing for inflation) compared to 2011 (ONS 2014d). At 1.72 per cent of GDP, it was below the average level of spending across the EU (2.06 per cent) and well below levels in countries like Germany (2.92 per cent) and Sweden (3.41 per cent). It is likely that the UK's spending is so low due to its loss of manufacturing over the last three decades and because of the high level of foreign ownership of British industry (firms generally prefer to do R&D in their home country). Raising it will, therefore, prove to be a tough challenge, requiring the government to play a prominent part.

There are five phases of innovation: R&D, patenting, technology trade, the start-up of new firms, and the growth of companies (Alsén et al 2013: 30). Traditional economic thinking tends to focus on R&D and commercialisation but the other phases are just as important. Policymakers need to support R&D and the commercialisation of new ideas; but they also need to ensure that conditions are right for the exchange of ideas and the establishment of start-ups, both of which are more likely to occur in industrial clusters.

A key role for government is the funding of basic scientific research. The UK's science budget has been protected from nominal cuts during the current parliament, but nevertheless it has been reduced by a 10th in real terms. Freezing the budget in nominal terms again during the next parliament – while this would constitute a relatively generous settlement given the probable scale of overall cuts – would mean that government spending on science had been cut by a fifth over the period of a decade. This would be a material blow to the prospects of an innovation-led boost to the UK's competitiveness and its ability to compete in global markets.

R&D on its own is not sufficient: the real growth benefits arise when the results of R&D are commercialised through collaboration between research institutions, such as universities, and the private sector. The government has backed Catapults to facilitate this process. But it could do more. It should put in place a set of incentives to encourage universities to focus more on commercialising the innovations of their researchers. In his review of universities and growth for the government, Sir Andrew Witty put forward a number of recommendations designed to increase the part universities play in supporting and promoting growth in the UK (BIS 2013).

These include:

- Make facilitating growth a 'third mission' for universities, alongside teaching and research. They should work together and with small and medium-sized firms to develop and commercialise technologies and report regularly to government on barriers to this activity and what needs to be done to remove them.
- Make available government funding of at least £1 billion over the life of the next parliament for collaborative projects to develop new technologies that will give the UK a comparative advantage in international markets. This collaboration should include universities and private firms.
- Increase to £250 million a year the budget for higher education innovation funding (HEIF), with a requirement that universities seek out innovative and potentially innovative small and medium-sized firms.

Finance is frequently a barrier to starting up a new business or expanding a relatively new one. Small enterprises, particularly in new industries with complex technologies, often find a lack of suitable financing to be a major problem. Although

some clusters may be able to rely primarily on private sector investment, there is a long-standing structural lack of supply of finance at the early stage of cluster development in the UK.

Government intervention is therefore justified. Governments can improve the funding of innovation by directly investing in a venture or by matching investment from the private sector. Contrary to the aversion for 'picking winners' in the UK, assessments have found that finance earmarked for specific purposes and particular projects is more effective than general subsidies or grants with no clear set of objectives (EC 2010). There are many examples of this philosophy being put into practice successfully. In France, for example, the government has provided funds towards innovation and research activity in the micro/nanotechnology cluster, in partnership with the private sector (Potter and Miranda 2009). In Israel, the government has successfully invested in local ventures before they are able to attract interest from established venture capital firms (EIU 2011).

Providing finance for start-ups and relatively new businesses that are looking to expand is a role that could be fulfilled by a British Investment Bank (for background, see Dolphin and Nash 2012). A number of other countries have national investment banks that provide finance for firms that would otherwise struggle to obtain it, and the absence of such a bank in the UK might help to explain why it has lower levels of R&D and less-developed medium-sized firms than many comparable economies. The Industrial and Commercial Finance Corporation, which was set up in the UK after the second world war to provide finance to small and medium-sized firms, operated through a regional branch network to ensure investments were made on the basis of good knowledge about the firm, its prospects and its market. A British Investment Bank should be set up to mimic this model. In particular, lending should be directed towards start-ups and new firms that are looking to expand within successful clusters.

5.5 Fostering skills

A skilled labour force is essential for a cluster to thrive. Skills gaps are commonly cited as the biggest barrier to the growth of clusters, particularly a shortage of graduates in science, technology, engineering and mathematics (the STEM subjects) and of people with the vocational skills required by manufacturers (Clark 2013, CfC 2014). Government polices to support clusters should therefore include the provision of workers with world-class skills.

Successful clusters are able to draw on a pool of skilled local talent. In particular, successful innovation-led clusters require people with specialist skills, and many firms choose the location of their R&D centres based on their ability to hire a workforce with the relevant specialist skills (EIU 2011). A talented workforce also helps to attract inward investment, stimulates the growth of new businesses, and can support the development of successful, established companies within a cluster. For innovation-led clusters, entrepreneurial talent and individuals who are willing to take risks to establish new companies and spin-offs are particularly important. While talented people might naturally migrate towards a successful cluster, an emerging one is more likely to need help in ensuring there are sufficient numbers of skilled workers. Governments play an important role in equipping the workforce with the necessary skills and many countries emphasise human resource development as one of the main elements for their cluster policies.

The traditional way of thinking about skills is from the perspective of individuals, and the need to match their skills to demand in the labour market. In particular, young people are encouraged to earn the qualifications that employers require, to undertake additional training, and to gain work experience so that they are ready to

take the jobs that are on offer. And later in life, as jobs evolve, they are expected to retrain and up-skill to adapt.

However, we argue that more attention should be given to the role of employers in preparing young people for work (Dolphin 2014). Employers have a major interest in how ready young people are for the world of work, but in the UK they appear to have developed a belief that it is the role of the state to produce work-ready young people they can simply hire 'off the shelf'. This view needs to change: employers need to become much more involved in the transition of young people from education into employment, and in vocational education and training in particular. Employers within clusters need to work together to identify existing skills shortages and likely future skills needs. They should then collaborate with local further education providers to ensure that the right courses are available and that curriculums cover the essential elements needed for the work opportunities that they will be offering. They should also reach out to young people, for example through visits to schools, to raise levels of enthusiasm about working in their cluster and to ensure that young people are aware of available opportunities and the qualifications they will need to acquire if they want to take advantage of them.

If the UK economy is not to settle into a low-value-added, low-wage rut, employers will also have to evolve their businesses in a way that increases the demand for skills (Lawton and Lanning 2012). This will not occur solely by firms changing their processes and going out into the labour market to find new workers with additional skills. Instead, firms and their workforces have to improve their productivity together. This suggests a new way of thinking about the development of skills: as a collective process that can be conceptualised at the level of the firm or the cluster (James et al 2011). From this perspective, the acquisition of skills is closely related to innovation, and learning is seen as acquiring the ability to adapt to change and participate in new work practices.

There is, therefore, a big role for employers. Nevertheless, policy can support the development of the skills crucial for a cluster, for example through establishing skills centres that offer training programmes to employees in small and medium-sized businesses, so that they can improve their technical knowledge or programmes designed to upgrade managerial skills (OECD 2007). The government can also act as a broker, linking businesses and higher education institutions, as the DTI did in the late 1990s and early 2000s. This led, for instance, to British Aerospace working with the University of the West of Scotland in Ayr to create a specialised engineering and science degree focussing on aerospace, with the ultimate aim of widening the pool of appropriately skilled labour for companies situated in the area.

Initiatives like this can play a small role in increasing the number of people in the UK with STEM qualifications, at graduate level, but more needs to be done if the UK is going to have sufficient skilled workers to enable industrial clusters to grow and thrive. University technical colleges are designed to provide young people aged 14 to 18 with vocational training in the STEM subjects alongside a strong general education. Expanding their number would help to close the UK's STEM skills gap. However, this goal will only be achieved if sufficient numbers of young people can be persuaded to take up the available places. To increase the chances of this happening, more resources have to be put into careers guidance so that young people are fully aware of the opportunities that will open up for them if they develop STEM skills.

There need to be significant improvements in college-based vocational further education and training to make it more relevant to employers. Apprenticeships should have a central role to play in ensuring that the UK's vocational education and training system produces the number of technicians that the country needs, but this is not currently the case. A number of steps are required to improve apprenticeships so that

they become a high-quality route into work for young people. These include allowing only people aged 23 and under to start an apprenticeship (other than in exceptional cases); requiring apprenticeships to be taught at level 3 and above, and requiring them to last for at least a year; and requiring at least 30 per cent of an apprentice's time to be spent in off-the-job training (for more details, see Dolphin 2014).

However, the solution to the UK's skills problem is not to develop a world-class apprenticeship system accompanied by a second-rate full-time vocational education and training system. Full-time vocational education and training should lead to a qualification that is as highly regarded by employers as a successfully completed apprenticeship. This means more hours of studying and more work experience.

Fixing the shortage of STEM graduates and young people with the right vocational skills in the UK will take time. In the interim, it is important that the UK attracts and retains skilled workers from the rest of the world. The globalised nature of the world economy makes it inevitable that some of Britain's talented people will be offered and will take up opportunities to work elsewhere in the world. The UK also has to be able to dip into the global talent pool. Highly skilled people in particular are needed if the UK is to improve its record on innovation and the commercialisation of new ideas. Furthermore, a cluster of talented people will attract investment from overseas. Immigration policy should not prevent skilled people moving to and staying in the UK (for background see IPPR 2014, particularly ch 4).

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We believe that an industrial policy focussed on supporting clusters in these ways has the potential to reverse the long-running failure to diversify the UK's export base. The long-term payoff of this kind of rebalancing act would be a stronger, more resilient economy and a trade account that means the UK is no longer failing to pay its way in the world.

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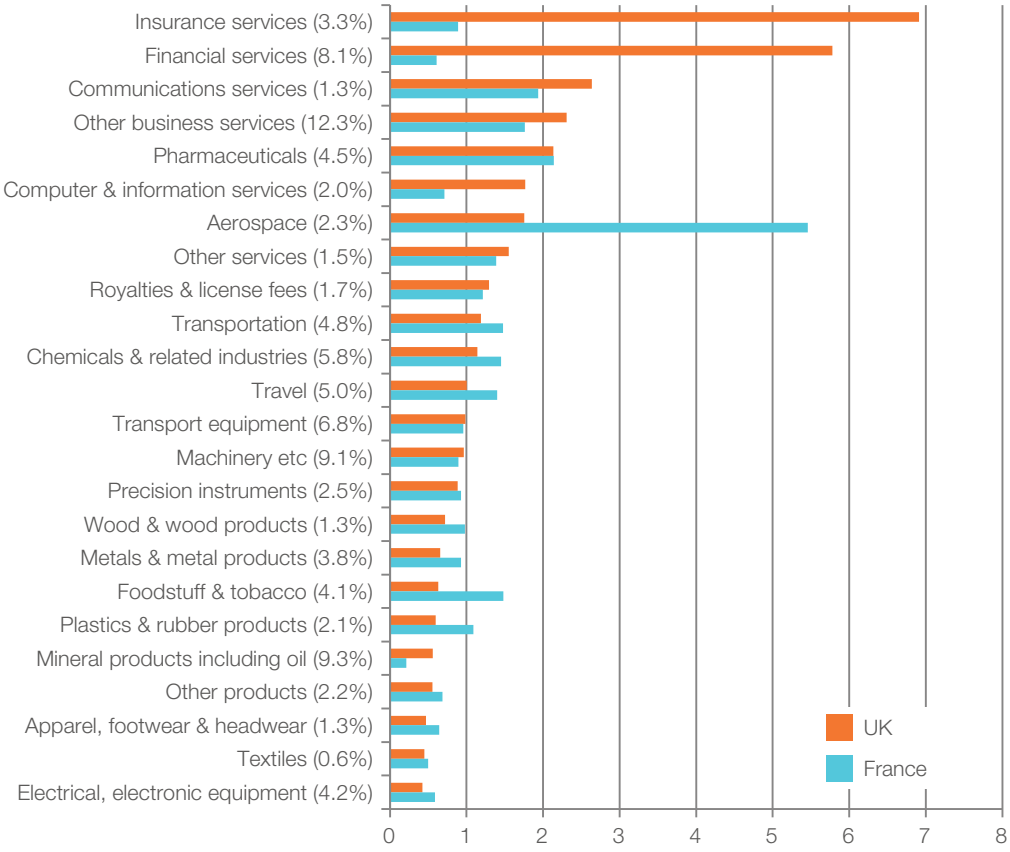
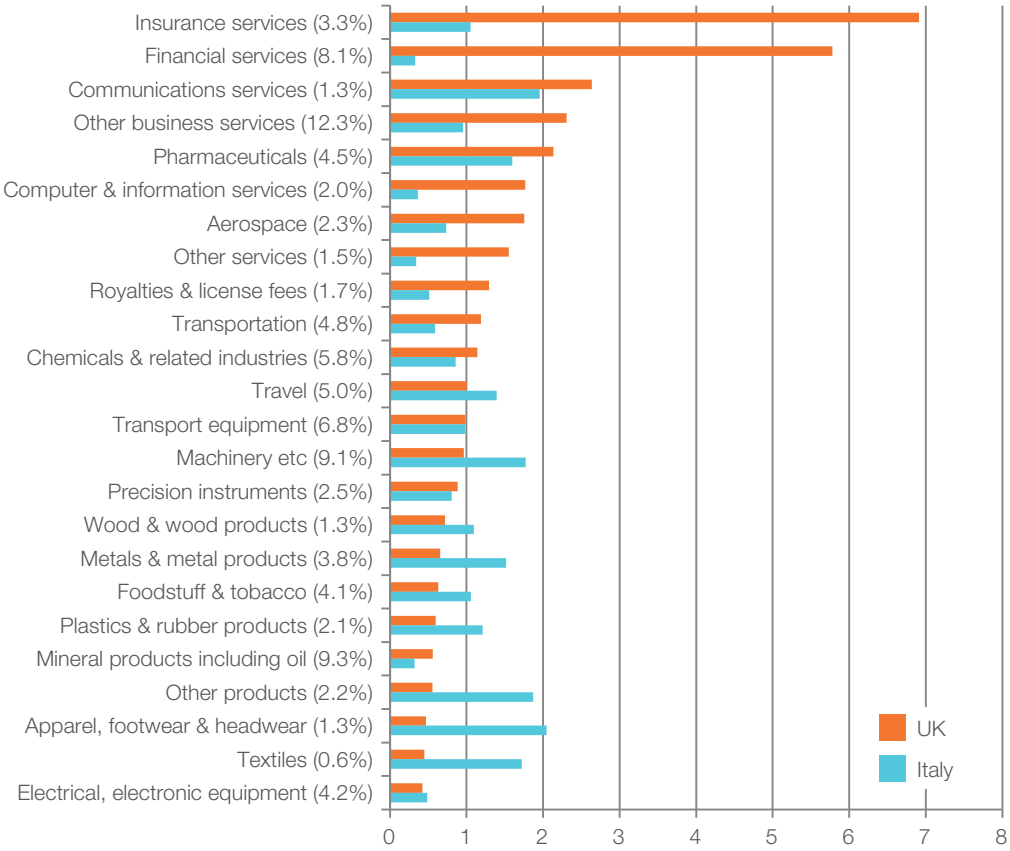
APPENDIX 1: INTERNATIONAL COMPARISONS OF REVEALED COMPARATIVE ADVANTAGE

Figure A1.1
Revealed comparative advantage by sector (with UK sector share in total exports), UK and France, 2012



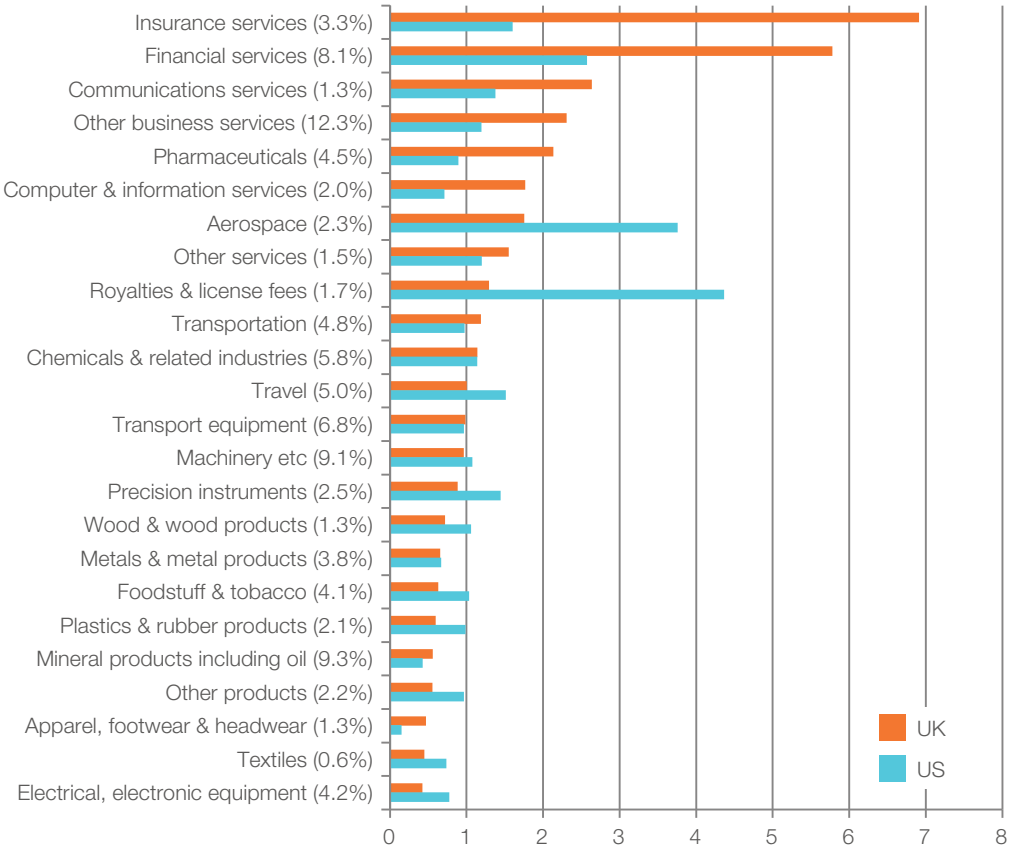
Source: Author's calculations using data from the International Trade Centre (ITC A)
Note: Erratic items – pearls, precious stones, metals, coins and works of art, collectors' pieces and antiques – were excluded from the calculation.

Figure A1.2
Revealed comparative advantage by sector (with UK sector share in total exports), UK and Italy, 2012



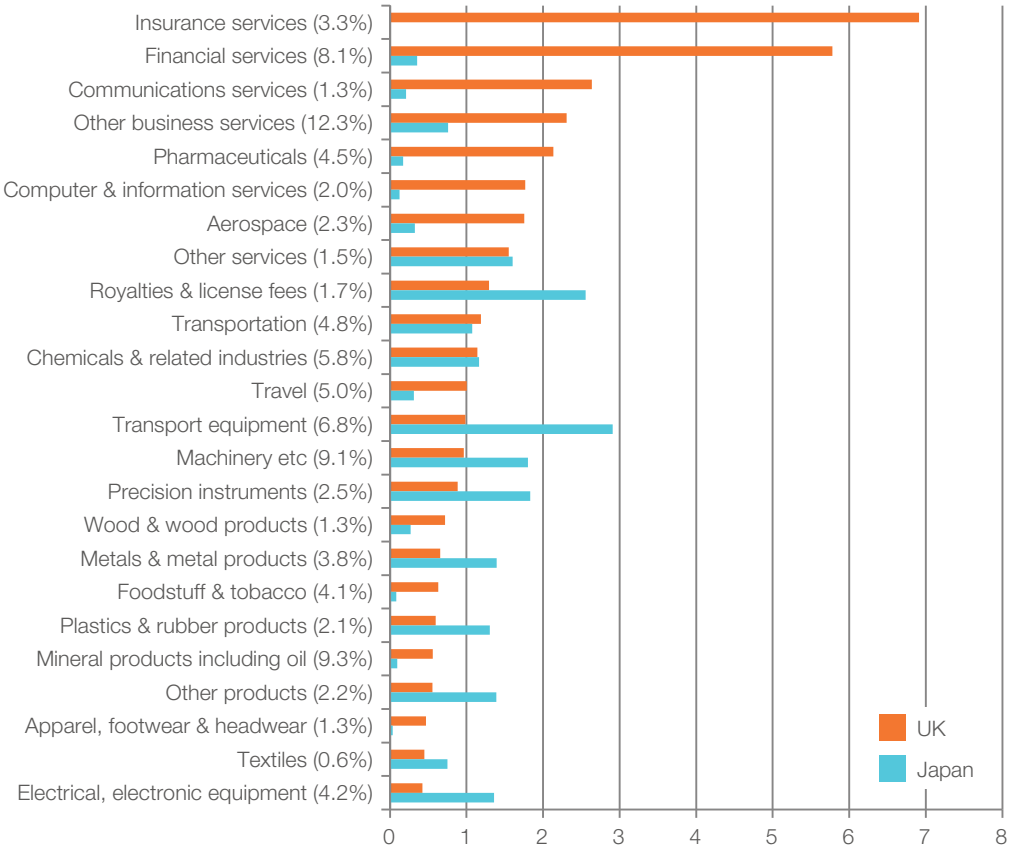
Source: Author's calculations using data from the International Trade Centre (ITC A)
Note: Erratic items – pearls, precious stones, metals, coins and works of art, collectors' pieces and antiques – were excluded from the calculation.

Figure A1.3
Revealed comparative advantage by sector (with UK sector share in total exports), UK and US, 2012



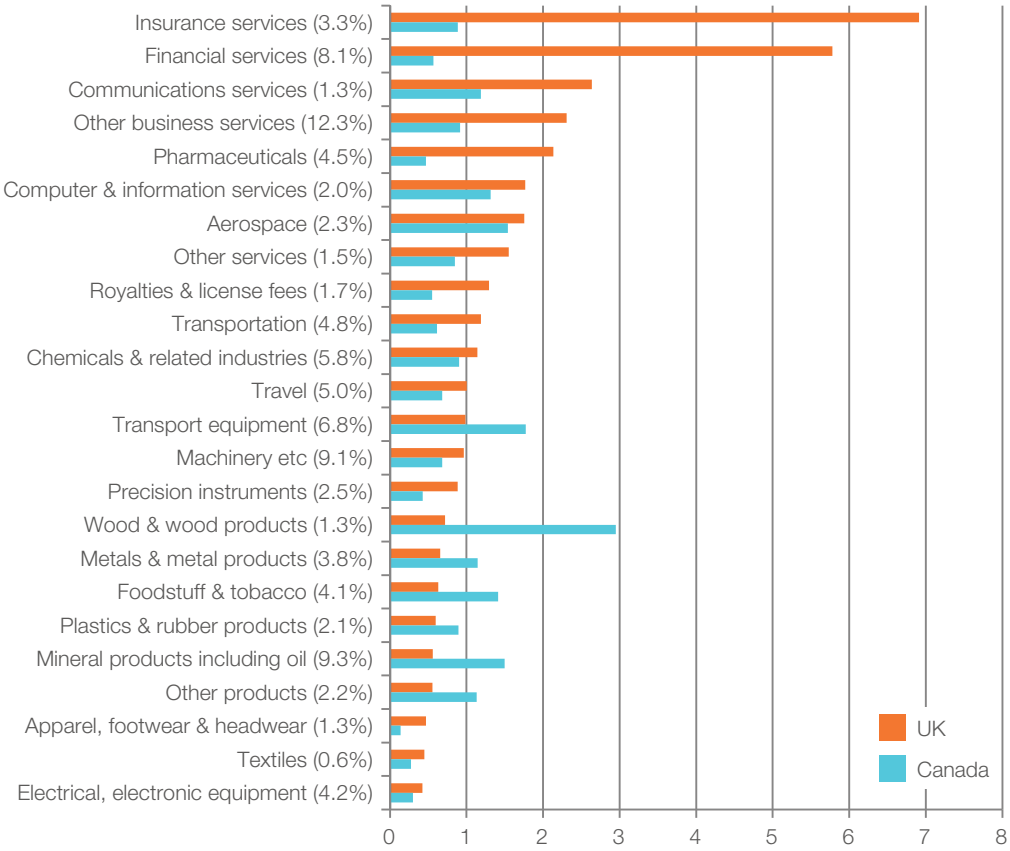
Source: Author's calculations using data from the International Trade Centre (ITC A)
Note: Erratic items – pearls, precious stones, metals, coins and works of art, collectors' pieces and antiques – were excluded from the calculation.

Figure A1.4
Revealed comparative advantage by sector (with UK sector share in total exports), UK and Japan, 2012



Source: Author's calculations using data from the International Trade Centre (ITC A)
Note: Erratic items – pearls, precious stones, metals, coins and works of art, collectors' pieces and antiques – were excluded from the calculation.

Figure A1.5
Revealed comparative advantage by sector (with UK sector share in total exports), UK and Canada, 2012

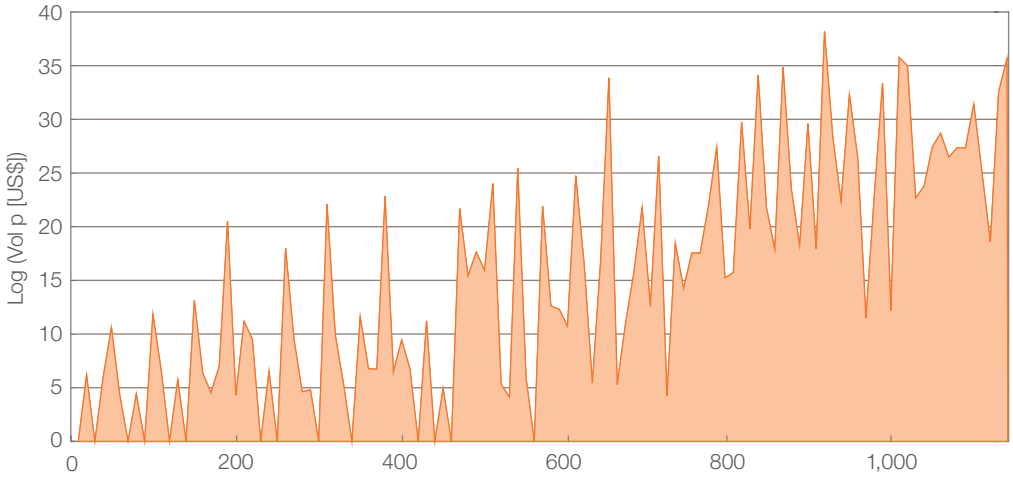


Source: Author's calculations using data from the International Trade Centre (ITC A)
Note: Erratic items – pearls, precious stones, metals, coins and works of art, collectors' pieces and antiques – were excluded from the calculation.

APPENDIX 2: SPECTROGRAPHS

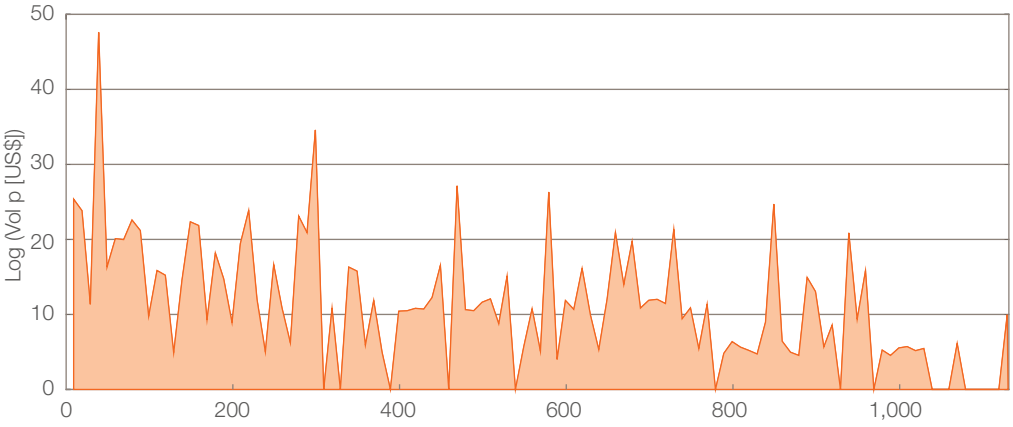
The charts in this appendix were produced by Riccardo Di Clemente, in collaboration with other members of Professor Pietronero's team, using the BACI World Trade Database, which contains information on the exports of over 200 countries, detailed by over 5,000 products (though for the purpose of this analysis products were grouped into just over 1,000 categories).

Figure A2.1
Spectrograph of Japanese exports, 2010



Source: Research by Riccardo Di Clemente in collaboration with members of Professor Pietronero's team

Figure A2.2
Spectrograph of Canadian exports, 2010



Source: Research by Riccardo Di Clemente in collaboration with members of Professor Pietronero's team