

Bob Hancké and [Steve Coulter](#)

The German manufacturing sector unpacked: institutions, policies and future trajectories

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The German manufacturing sector unpacked: institutions, policies and future trajectories

Future of Manufacturing Project: Evidence Paper 13

Foresight, Government Office for Science

The German manufacturing sector unpacked: institutions, policies and future trajectories

By

Dr. Bob Hancké & Dr. Steve Coulter

London School of Economics and Political Science

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Executive summary

Germany is currently Europe's leading manufacturing exporter, therefore; its industrial model may contain important lessons for other advanced industrial nations coming to terms with the aftermath of the 'Great Recession'. This report analyses the German manufacturing sector from the analytical perspective of the three markets in capitalism (capital, labour and product markets); examines how they operate; what the role of policies and institutions has been in those; and assesses their medium and long-term viability.

Perhaps the principal conclusion of interest to policymakers is that the German state has a fairly limited role in directing industrial development. Government operates in an 'enabling', rather than strategic, capacity in industry by supporting key institutions, such as the training system and underwriting company loans. Instead, intra-sectoral networks of companies, trade unions, banks and technical institutions play the lead role in coordinating economic activity, and it is the depth and quality of this interaction, together with the micro-economic institutions supporting this, which is responsible for the country's manufacturing success.

German manufacturing firms dominate many high-value market niches, particularly automobiles and semi-customisable machine tools, however; they are not immune to competition from low-wage emerging economies and recent years have seen many large, internationally-oriented firms detach themselves from the domestic institutional framework. In doing so, they risk undermining Germany's vaunted 'Mittlestand' SME sector. The system as a whole is also vulnerable to rigidities. These include: high wages, long employee tenure; an inability to move into high-tech, radically innovative product market sectors; and with decision-making structures that give voice to many potential stakeholders in the company. On the other hand, the system has proven remarkably resilient, as well as successful, and empirical evidence presented here shows it is far from redundant.

The report also offers some tentative policy suggestions for the UK, while at the same time warning of the difficulties of supplanting German institutions and policies into the more market-oriented UK setting.

Synopsis

Introduction: Outline of the paper, together with a brief introductory of recent developments in industrial policy in Germany.

Finance: Germany's 'hausbank' system and its provision of long-term 'patient' capital is described and evaluated, and the role of state-backed industry banks such as the KfW is also examined.

Labour Markets and Skills: Co-ordinated wage bargaining and industrial democracy, giving employees and other stakeholders a key role in company decisions, plays a key part in the German production system. As well as ensuring industrial peace, the long-term relationships which ensue incentivize firms and workers to embark on high-quality technical and vocational training.

Firm coordination and innovation strategies: The manufacturing sector is underpinned by a range of institutions promoting 'strategic' (i.e. non-market) interaction between firms and other agents. This supports an innovation process that allows for steady, 'incremental' improvements to product lines, resulting in high quality.

Complementarities in the German manufacturing sector: This section examines how the country's manufacturing system functions as a whole. The success of the model is underpinned by the presence of a set of mutually complementary institutions which produce an outcome that is superior to the sum of its parts.

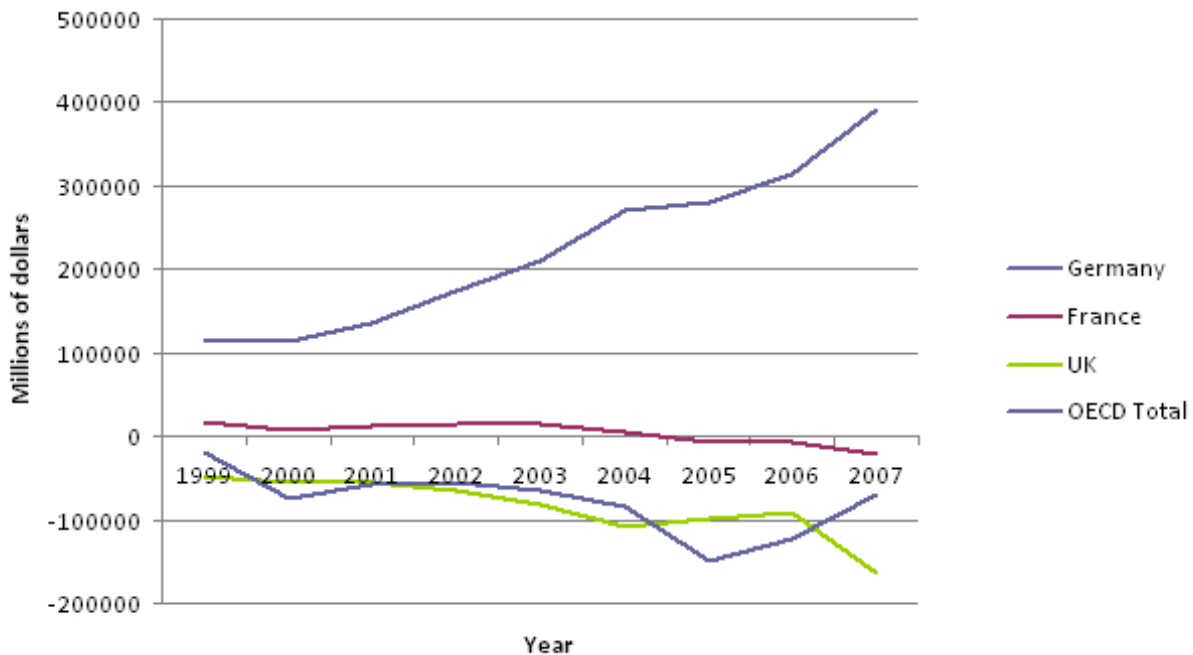
Future trajectories: The challenges to the model arising from financial globalization and competition from low-wage economies are examined and evaluated, as well as endogenously-generated tensions within the system itself.

Are there lessons for UK Policymakers? The organization of the UK and German economies differ significantly in that activity in the former is coordinated primarily through markets, whereas German firms also benefit from collaborative networks that produce non-market coordination. Any attempt to 'borrow' German policies needs to recognize this, although there may be scope for limited institution-building.

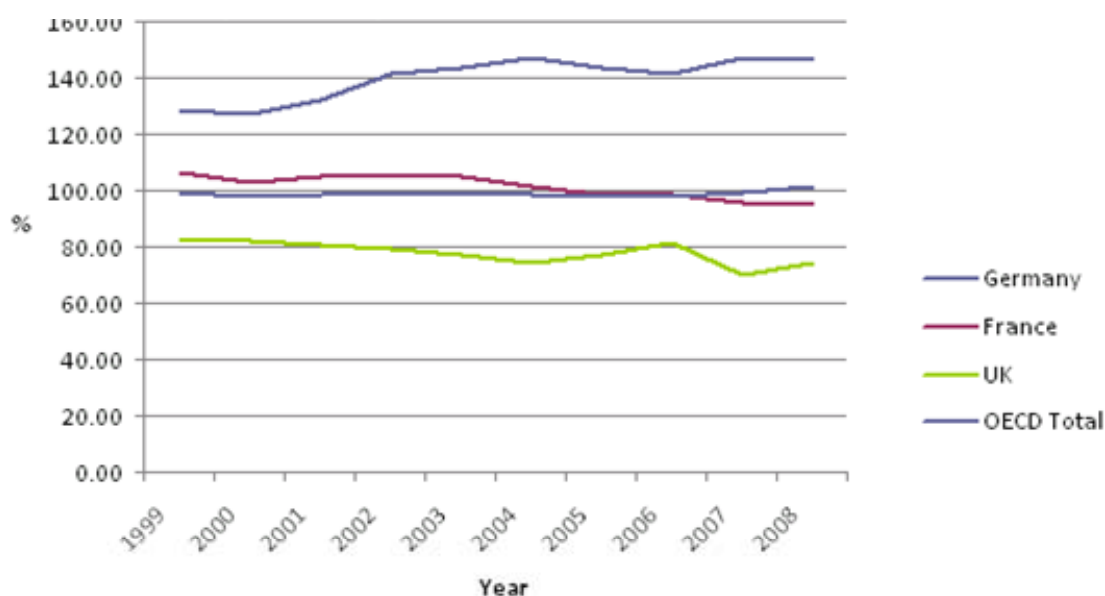
I. Introduction

German manufacturing success has been the envy of many OECD economies. Even in the dark years of low growth after unification in 1991, German exports of goods grew significantly, both in absolute terms and expressed as world share of exports. It should therefore not come as a surprise that many economies have attempted to emulate the policies that underpinned this success: France under President Mitterrand did so in the early 1980s (Levy 1999), MIT's Productivity Commission in the late 1980s invoked German industrial prowess (Dertouzos et al. 1989), and many Central European economies considered the German model as a possible example of sustainable capitalism early in the transition period. Today, with Germany seemingly at its export apex again, interest in the policies and institutions underlying German manufacturing (export) success has been growing everywhere, including the UK. This is not particularly surprising, given Germany's superior manufacturing export performance over the last 14 years, both as a proportion of trade in (Figure 1) and in money terms (Figure 2).

Figure 1: Trade balance in manufacturing



Source: OECD STAN indicators 2009

Figure 2: Export-Import Ratio in manufacturing

Source: OECD STAN indicators 2009

The analysis of the policies and institutions underpinning the strength of German manufacturing in this report starts with one important observation. Compared with France and the UK during the post-war era, where the state has played, or at the very least attempted to play, a central role in steering the supply-side of the economy, Germany has witnessed relatively few direct government policies that support manufacturing. The very few exceptions are well-known – industrial credit through the reconstruction bank KfW, or the industrial expertise that the Fraunhofer institutes in applied research offer to local companies and beyond, for example – but on the whole, the government has satisfied itself with providing framework conditions, leaving the substance of policies to strong autonomous employer, business and trade union associations. These frameworks worked very well in stable sectors, which rely on well-known technologies and experience stable, moderate growth. The advent of less predictable sectors such as telecommunications, software and biotechnology has raised the question of to what extent these relatively dense institutional frameworks work well for these new sectors as well.

Overall, however, the German manufacturing system continues to be extremely successful, despite what are often seen as problematic elements such as high wages, long employee tenure, an inability to move into high-tech radical innovation product market strategies, and decision-making structures that give voice to many potential stakeholders in the company. Research by the German Institute of Economic Research (DIW) suggests the country has the second largest machine-tool and engineering industry of all industrialized countries, generating a fifth of total global value-added in the sector (DIW Economic Bulletin 5, 2012). Econometric analysis indicates that the rapid rebound in Germany's export market share after 2000 owed to a combination of its success in building trade relationships with emerging economies; but also a prolonged effort in containing costs through wage moderation, negotiated through Germany's coordinated wage bargaining system (Germany in the Globalisation Process, Bundesbank Monthly Report, December 2006; Danninger and Joutz 2007). The German manufacturing sector also provides significantly more employment than in the UK.

**Table 1: Total Employment in Manufacturing in millions
(OECD Economic Surveys: Germany 2010)**

| | | | | | | | |
|---------|------|------|------|-----|------|------|------|
| Germany | 7.9 | 7.75 | 7.63 | 7.5 | 7.45 | 7.54 | 7.66 |
| UK | 3.85 | 3.67 | 3.5 | 3.3 | 3.2 | 3.1 | 3.1 |

The response of German policymakers to the challenges presented by unification after 1990 illustrates well the indirect and limited nature of state intervention. Debates about the country's poor economic performance in the 1990s, largely conducted between the German Council of Economic Experts, European Commission and OECD, focused on supply-side weaknesses: including labour market rigidities, an inability to exploit new technologies and paucity of innovation capacity (cf. 'Raising Germany's Growth Potential, Occasional paper No 28, DG for Economic and Financial Affairs, European Commission 2007). Labour market interventions, culminating in the Hartz reforms of 2002-2005, increased flexibility at the lower end but – perhaps intentionally – had little effect on the core of skilled manufacturing employees (Carlin and Soskice 2008).

Other moves to support technological restructuring centred on beefing up state subsidies to nominated growth sectors, such as aerospace and biotechnology, and encouraging equity finance through the privatisation of Deutsche Telekom in 1996 and the establishment of the *Neuer Markt* stock market for start-ups. These, likewise, produced mixed results, with the Neuer Markt collapsing following the dot-com bust of 2000 (Owen 2012). Although consolidation in the aerospace industry was relatively successful, thanks to strong political support, Germany largely failed to incubate the world-beating biotechnology industry that its policymakers intended (Adelberger 2000). Moreover, large areas of the economy, such as the wage bargaining system, saw no little or no intervention.

Informed commentators have therefore tended to characterise the state's role in Germany as that of an 'enabler', supporting institutions and policies which have a generalised impact on industry, rather than enjoying a wider developmental role (Vitols 1996). Even the challenges presented by the financial crisis of 2008-09 and ensuing global recession have not prompted the German government to abandon its hands-off, 'supervisory' stance on industrial policy, neatly summarised by its economic advisory board: '*The state's role in this scheme of things is to act as a strong and neutral arbiter, ensuring that market principles are upheld and providing a practical legal framework for restructuring the economy*' (German Council of Economic Experts, Annual Report 2009/10).

In this paper on the roots of German manufacturing success, we will use the analytical perspective of the three markets in capitalism (capital, labour and product markets – with some additional attention to inter-firm relations in the case of the latter). We start with an examination of how they operate (and to some extent how they differ from other EU economies), what the role of policies and institutions has been in them, and assess their medium and long-term viability. The first section deals with the organization of the capital market and its impact on governance structures, the second with the institutions governing the labour market and the third with innovation strategies. Sections 4, 5 and 6 analytically dissect the functioning of the German system as a whole, and evaluate the future of the system as well as the lessons that can be learned for the UK.

2. Industrial finance in Germany

In all capitalist economies, sources of industrial finance come in three types: retained earnings, bank loans and equity. Until very recently, the dominant modes of industrial finance in Germany were, in descending order, retained corporate earnings and bank loans. Even when shares were issued, these were often distributed through a preferential arrangement involving one particular bank – the *hausbank* (house bank). Individual shareholders among the public at large could, in principle, only buy company shares with that bank, and the bank would hold them collectively in trust for all small shareholders, which gave the bank, as the proxy voter for all these shares, a large voice in company affairs.

The German ‘stakeholder’ system of finance and corporate governance has worked very well, but primarily for large firms in Germany; small and medium sized firms, the backbone of Germany’s export industry – the so-called *Mittelstand* – have secured access to finance through a system primarily based on local savings banks (*Sparkassen*). Along with co-operative banks, the *Sparkassen* provide about two-thirds of all lending to *Mittelstand* companies and 43% of lending to all companies and households (*Economist*, November 10th 2012). Above this structure of local banks sit the regional *Landesbanken*, which act as wholesale banks for the savings banks and can also provide more sophisticated services, such as hedging and offshore financing.

Finally, the state sponsors several public and quasi-public institutions charged with supporting long-term lending. For example, the *Industriekreditbank* (IKB) specialises in direct loans to manufacturing firms of between 100 and 500 employees; while the *Deutsche Ausgleichsbank* (DtA) encourages business start-ups through loan and equity capital assistance programs.

However, the best known of these is the state-owned Reconstruction Loan Corporation, or *Kreditanstalt für Wiederaufbau Bankengruppe* (KfW), a public law institution which was established after WWII explicitly to compensate for the short-termist lending policies of the major commercial banks. The KfW has had two principal functions in the post WWII era. First, it orchestrates capital market funding for a range of larger industrial and developmental projects through issuance of state-guaranteed bonds. The bank has been used as a strategic tool for reorganising declining sectors e.g. the steel and ship-building industries in the 1970s and 1980s, which were rapidly modernised and had excess capacity stripped out.

Secondly, the KfW refinances banks with established relationships with *Mittelstand* firms; these are provided with capital at the cost available to publicly-listed companies at fixed rates of long duration, up to twenty years in some cases.

Applications for loans from the KfW are typically made through the firm’s *hausbank*, which assumes the default risk but is spared the interest rate risk as the loan is refinanced by the KfW. In conjunction with the Technology Participation Company, or *Technologie-Beteiligungsgesellschaft* (TBG), the KfW was also instrumental in creating the German venture capital industry largely from scratch during the 1990s (Martin et al 2003). KfW lending totalled €70bn in 2010 (KfW Annual Report 2011). A new focus for the KfW is funding green projects, spending €25.3bn on them in 2010 (*FT*, November 28th 2012).

However, the KfW has been criticised for poor oversight in connection with its 2001 acquisition of a one-third stake in *IKB Deutsche Industriebank* – a key Mittelstand lender which had to be bailed out after transferring €300m to Lehman Bros. on the day it collapsed in September 2008 (*Economist*, 22nd April 2010). Suspicions have also been aroused over its acquisition of a 15% stake in the Airbus consortium, EADS, in late 2012 in order to bring the German government's shareholding up to that of the French – sparking fears over it becoming embroiled in a more dirigiste industrial strategy and possible politicisation (*Economist*, 3rd November 2012).

How effective are these quasi-public institutions in compensating for market failures in the provision of capital? Vitols has suggested that the decentralised German system has helped to support a larger SME sector than is the case in other advanced countries, as these firms need more help in coping with labour and product market regulation (Vitols 1996). The state development banks, such as the KfW, help to solve the credit-rationing problem endemic to SMEs, but without displacing the important monitoring function to guard against bad loans which is provided by the hausbanks (Carlin et al 1995).

2.1 Characteristics of the industrial finance system

The essence of the German system of industrial finance – and a key point of contrast with the UK – is a close, long-term relationship between manufacturing firms and their banks, with equity finance playing a much more limited role. However, it is not just the prominence of bank finance that is at issue, but also the character of the relationship. German manufacturing firms have access to bank finance that is not typically provided to them on the basis of publicly available data or current returns, as is the norm in the UK. The hausbank relationship hinges on a two-way exchange of inside information between banks and firms. The hausbank may simultaneously lend money to the firm, own its shares; have seats on its supervisory board and vote at shareholders' meetings.

The hausbank often provided the president of the board of directors (or, better: its German equivalent, the supervisory board, which has representatives of labour as well as capital and groups and companies with a stake in the company's performance, such as local and regional governments, or other companies). This presence endows the hausbanks with considerable influence over the managerial strategy of the firm and provides them with a constant flow of information that allows them to closely monitor the value of their investment. As well as close bank-firm involvement, other firms in the industry may take directorships on the supervisory boards of firms within their network and this is further supported by cross-shareholdings and engagement in joint research and product development. Hausbanks are also important in funding new business start-ups, with a third of these reliant on short and long-term bank loans. This figure falls only slightly by the fifth year of the businesses' life (KfW/ZEW Startup Panel 2012).

Another key feature of the stakeholder system is ownership concentration. A relatively high proportion of German firms are family-owned; in others, it is common for a single major shareholder, perhaps a bank, to hold a dominant, blocking stake. Pyramidal ownership – where a dominant shareholder is able to exercise control of one company through the ownership of another – is also commonplace. Table 2 below, using data collated by Enriques and Volpin (2007) illustrates these characteristics in a comparative context.

Table 2: Ownership Concentration of firms (Enriques and Volpin 2007)

| | Widely held | Family control | Pyramid control | Median largest voting block |
|---------|-------------|----------------|-----------------|-----------------------------|
| France | 60% | 20% | 15% | 20% |
| Germany | 50% | 10% | 20% | 57% |
| Italy | 20% | 15% | 20% | 55% |
| UK | 100% | 0% | 0% | 10% |
| USA | 80% | 20% | 0% | 5% 9% |

The main drawback of these arrangements is that company policy may remain opaque to those on the outside of the network, and there is a heightened risk that insiders will focus on their own interests at the expense of minority shareholders (Baums and Scott 2005). The system is also risk-averse and may hinder the reallocation of capital to new business start-ups.

However, it is crucial in fostering the long-term investment horizons which underpins high-quality production strategies. This is because firms are integrated into networks of partners that help to insulate them from hostile takeovers by other companies (Faccio and Lang 2002). Managers are able to calculate profit and loss over a longer period of time, ironing out fluctuations in the business cycle that might otherwise deter investment. The absence of an active market for corporate control (takeovers etc.) also means workers are incentivised to acquire high levels of firm-specific technical skills, and the careful, incremental, approach to innovation that is a characteristic of German manufacturing firms is also supported.

However, for these networks to function effectively, reputation is key. The (future) viability of business plans rests on a (past) reputation for veracity and straight-dealing with suppliers and customers. Sanctions for providing false information may include exclusion from the network and loss of access to its benefits. Reputational monitoring is provided through three mechanisms: a) the relationships with suppliers and clients; b) the knowledge secured from networks of cross-shareholdings; c) membership of industry associations that share information about training, standard setting and technology transfer (Vitols et al 1997).

The high level of bank-firm coordination in Germany provides a particularly sharp contrast with the organisation of business in the UK. Firms in the UK interact with each other, and with their suppliers and providers of finance, primarily through market relationships underpinned by a much more pro-competition regulatory system. Information about firm strategy and performance is relayed to investors and others through public channels. Firms interact with banks primarily as a means to raise capital - or they tap into the equity markets - and the result is an arguably more short-termist approach to investment and product market strategy. An illustration of this is that the private equity industry is much less developed in Germany, accounting for just 0.44% of GDP in 2008 (against 1.03% in the UK and 0.64% in France, according to the German Private Equity and Venture Capital Association (BVK).

Nevertheless, the 'Anglo-Saxon' model of industrial finance and corporate governance is appealing to the top tier of German firms and financial institutions, and the German 'stakeholder' model has been subject to many of the same pressures that have faced the UK, namely the internationalisation of finance and growth in importance of institutional

investors and venture capital. A series of corporate governance reforms were set in motion in the 1990s with the aim of fostering capital market development and diluting insider control, culminating in publication of the German Corporate Governance Code in 2002 which clarified minority shareholders' rights. This was bolstered by developments at the EU level intended to enhance investor confidence by clamping down on insider trading (Noack and Zetsche 2005).

German savings banks themselves have also been forced to change their strategies as a result of a wave of disintermediation in the 1990s. Disintermediation occurs when savers place money with non-bank financial institutions to boost returns and firms find that issuing debt to savers or non-banks may be cheaper than borrowing from banks. Some large German banks are increasingly disengaging themselves from industry in order to pursue international opportunities. The reorientation towards investment banking activities has also eroded the diversification advantages to banks of owning block-shareholdings in industry as close ties with industrial companies are potential barriers to generating deals with competitors (Höpner and Krempel 2004). For example, Deutsche Bank, which used to own large stakes in firms in sectors as diverse as insurance, car manufacturing and food processing, has now entirely unwound these cross-shareholdings (*The Economist*, February 3rd 2011).

For their part, some large manufacturing companies are seeking to bear down on costs by re-locating production to cheaper locations, for which they look to international capital markets rather than loans from their hausbank (Lütz 2000). In doing this they inevitably encounter investors who are primarily interested in shareholder value, rather than the broader needs of stakeholders. The takeover of Mannesman by Vodafone in 2000 may have been exceptional, but it also demonstrated the potential vulnerability of even major German firms to hostile takeovers. This threat has arguably influenced the strategic decisions of some companies: for example Hoechst, which sold its chemical businesses in order to focus on pharmaceuticals; and the merger of Daimler-Chrysler.

Some analysts therefore argue that Germany's finance and corporate governance system now resembles a hybrid of a traditional stakeholder system meshing with increasingly important elements of the shareholder model (Odenius 2008). Nevertheless, there are plenty of indications that the continued absence of a genuine market for corporate control reduces the likelihood that the stakeholder core of German capitalism will be fatally undermined (Goergen et al 2008). So far only the top tier of the more globally oriented sections of finance and industry has been heavily affected, and there is a debate over whether even these are fleeing or merely exporting the German industrial model (Dörrenbächer 2004).

Moreover, the majority of SMEs still prefer to maintain the classic hausbank relationship with savings banks and credit co-operatives. Bank lending to the private non-household sector has held up well, despite a general tightening of credit conditions since 2008 (Deutsche Bundesbank Annual Report, 2011). German SMEs are still significantly more likely to hold bank loans (54%) than those in the UK (25%) (AXA International Small Business Report, 2012).

A detailed examination of recent corporate ownership and governance data for OECD countries by Carlin finds only limited evidence of a fundamental erosion of the stakeholder model of finance. Company restructuring continues to be negotiated within a broadly unchanged structure of control which is entirely consistent with the strong improvements in export competitiveness noted elsewhere in this paper– i.e. it did not result from rearguard action by vested interests to block change, which would have been detrimental to company performance (Carlin 2009). Focusing on international mutual and hedge funds, Goyer has also noted a marked preference for these to take stakes in French over German firms because the greater degree of management autonomy in the former meshes better with their short-term strategies (Goyer 2007).

3. Labour markets and skills

German manufacturing firms operate an industrial system known as Diversified Quality Production (DQP). This term describes a product strategy which applies the techniques of volume production to high quality product lines (Streeck 1992). Workers in DQP systems enjoy substantial autonomy, which they are encouraged to use to make incremental improvements to production processes. DQP systems are therefore vulnerable to hold-up problems, such as strikes and lockouts, and hence require extremely good labour relations to function. Firms operating DQP strategies also require a reliable supply of workers equipped with a high level of industry-specific technical skills. This section deals with each of these concepts in turn.

3.1 Wage bargaining and industrial democracy

Bargaining over wages and other matters in Germany is generally conducted at the industry or sectoral level but is underpinned at the firm/shop floor level by a system of industrial democracy which fosters a more coordinated and consensual approach to industrial relations than is evident in the UK.

This so-called ‘dual’ system of industrial relations is responsible for facilitating negotiated adjustment, so firm and industry restructuring in response to the changing competitive environment is more likely to take place in a consensual manner, reducing the risk of industrial unrest. The dual system rests on institutional foundations of strong, centralized trade unions and employer’s associations, organized along sectoral, rather than craft, lines. This is underpinned by a statutory system of plant level worker representation, operating through autonomous works councils, which have legal authority to enforce collective agreements.

Workers are also represented on the supervisory boards of Germany companies in a system known as ‘co-determination’ (*Mitbestimmung*). Co-determination is legally guaranteed by: the Co-Determination Act of 1976, which guarantees equal representation of employees; and the Works Constitution Act, which was amended in 2001, and governs collaboration between staff, works councils, unions and employee’s associates. While formally separate from the unions, the works councils nevertheless help to shore up unions’ bargaining strength at higher levels (Thelen 2001).

A particular contrast with the UK is that German employers are significantly more organized than British firms. A division of labour exists between the *Bundesverband der Deutschen Industrie* (BDI), which deals with political lobbying and is the functional equivalent of the Confederation of British Industry (CBI), and the employers association *Bundesvereinigung der Deutschen Arbeitgeberverbände* (BDA). The latter coordinates the economic and collective bargaining activities of its industrial and regional members, and for which no UK counterpart exists. The proportion of German employers which are members of these associations – the employer organisation density – was 63% in 2007 (European Commission 2009).

The German government plays a minimal role in industrial bargaining, besides setting out the legal and institutional framework in which it takes place. The conduct of wage bargaining in the German system has a number of specific characteristics. As already noted, it is both more centralized and coordinated than in the UK (where it takes place at

the level of the plant, team or individual worker), although less so than in Sweden or Austria (where national or inter-sectoral bargaining is more commonplace). Bargaining often consists of pilot agreements whereby a lead negotiator, usually the powerful metalworkers union IG Metal, secures agreement with its counterpart employer association, Gesamtmetal, establishing the basis of wage deals across the rest of the manufacturing sector.

Union density in Germany, at 20%, is actually less than the UK, where 27% of workers are members of unions, according to the labour research organisation, the Hans Böckler Stiftung. However, the bargaining coverage of German unions significantly exceeds their actual membership, due to the coordinating capacities of unions. In 2007, about 56% of all employees in western Germany and 41% of employees in eastern Germany were covered by sectoral collective agreements, although the level has fallen by about 10% since the late 1990s. Company-level agreements covered 7% of employees in western Germany and 13% of employees in eastern Germany, according to Germany's Institute for Employment Research.

Such coordination results in a low level of wage dispersion (the spread between high and low earners), encouraging firms to coordinate with each other over the production of a range of industry-wide public goods, such as a high level of firm and industry-specific technical training (see below), as it reduces the ability of firms to free ride on the training efforts of others by offering higher wages to poach staff. Reflecting its more 'rigid' labour market, the labour reallocation rate is significantly lower in Germany than in the UK and other countries with 'flexible' labour markets (OECD Germany Survey 2010: 49). However, the OECD has also praised the workings of the German labour market, drawing attention to the role of active measures, such as working time accounts and short-term work schemes, in maintaining employment in manufacturing following the financial crisis (OECD Germany Survey 2012: 10-11).

Some commentators point to a growing incidence of large firms defecting from industry wide-collective wage agreements and putting pressure on suppliers to cut their prices through a wage squeeze, as well as a fall in the number of union affiliations to the DGB, as evidence of a crisis in the German industrial relations system (Streeck 2008). A number of employers in eastern Germany have stayed out of national employers' associations in order to preserve wage and cost advantages (Silvia 1997). Tension within the bargaining system came to a head in an unsuccessful strike in 2003 by IG Metal, which had called for a reduction in working hours in the auto industry in East Germany. Its failure led to a crisis in the German trade union movement.

In a further indication of stress on the system, in 2005 Gesamtmetal introduced a new tier of membership status (*OT-Status*), which does not entail a binding commitment to collectively-negotiated wage agreements. This predictably led to a fall in the number of member firms bound by the sectoral agreements, from 4,189 in 2005 to 3,803 members in 2007 in western Germany, while the number not bound by these rose from 1,432 in 2005 to 2,229 in 2007 in western Germany (European Industrial Relations Observatory). The number of unions affiliated to the DGB has declined from 16 in the 1980s to eight currently, although this is partly the result of mergers and that number still includes Europe's largest and second largest unions, the service sector VER.DI as well as IG Metal.

Overall, the coordinated bargaining system has, because of the beneficial effects it produces for large firms, so far defied predictions of its demise and is seen as a key ingredient in Germany's manufacturing export prowess over the last decade, muting criticism.

3.2 Vocational skills

A critical ingredient for success in the quality-competitive German manufacturing system is a reliable supply of workers with firm and industry-specific skills. Such skills are costly to provide and acquire and so firms and workers considering investing in such skills rely on various assurances against possible skills redundancy, for example technical change or firm restructuring.

These assurances are provided by various institutional elements of *Modell Deutschland*. One mechanism for underwriting skills formation is, of course, the German welfare system, which provides a high level of wage compensation as well as few strictures on the type of job the claimant is required to take (Estevez-Abe et al 2001). Concern over high unemployment and labour market 'dualism' has prompted several attempts to overhaul the welfare system, culminating in the 'Hartz' I-IV reforms of 2002-2005. Pre-Hartz, active labour market policies (ALMP) were geared towards training and job creation that worked to maintain the occupational status of those in work while doing little for poverty alleviation (Jacobi and Kluve 2006). Hartz IV – the most far-reaching set of measures – redesigned the benefits system and placed more emphasis on the 'rights and duties' of claimants.

Yet many commentators claim these measures actually entrench dualism, as they do little to encourage cross-sectoral re-training of older and under-skilled workers and thereby serve to reinforce the position of skilled workers in core manufacturing export sectors (Carlin and Soskice 2008; Palier and Thelen 2010; Huo 2009).

Although Hartz eased restrictions on agency workers, these are still entitled to the same pay and conditions as full-time staff and there is little indication of any significant labour market effect outside the seasonal and service sectors (Ebbinghaus and Eichhorst 2006). While firms regularly express concerns about labour market issues, the fragmented nature of the political system and weak and divided peak business associations (as opposed to the well-organised sectoral level) has prevented the emergence of a broad coalition of employers to push for comprehensive reform (Martin and Swank 2012).

Germany's centralized wage bargaining system, discussed above, plays an important role in underwriting the skills system by providing negotiated wage protection. Coordinated bargaining reduces the chances that the wage levels for specific skills will decline in future, increasing the returns to workers making the effort to acquire a high level of firm and sector specific skills. From the perspective of employers, wage coordination across the sector also reduces the risk that expensively-trained workers will be poached by rival firms who choose to free-ride on the training efforts of others (Thelen 2000). The German system also provides assurances to trainees that firms will not renege on their training commitments and exploit them as cheap labour, thanks to a well structured regulatory framework and monitoring institutions. Where these guarantees are absent, as in the UK, the system becomes vulnerable to low uptake as legal training contracts by themselves may be unenforceable (Dustmann and Schönberg 2012).

The education and vocational training system in Germany is overseen by industry-wide employer associations and unions administering a publicly subsidized training system. The system negotiates industry-wide skills categories and training protocols and provides numerous apprentices to manufacturing firms. At the core of the German system of industrial skills provision is the 'dual' vocational training system, in which training usually lasts for three years. Around 70% of school leavers in vocational pathways learn an official state-registered trade through this system (A Learning for Jobs Review of Germany, OECD 2010). Every school leaver who has completed full time education has access to dual vocational training. The dual element of the training lies in the fact that the training path takes place in two places of learning: the company and the vocational training school.

This equips the trainees with both a basic technical understanding of the subject while showing them how this knowledge should be applied in the workplace. Successful completion of the training entails professional accreditation as a skilled employee, and the German Chambers of Commerce and Industry, as well as business associations and training institutions, provide opportunities for more advanced training and hold examinations for recognized qualifications (see next section).

Large firms often take on more trainees than they need, with the tacit understanding that the excess trainees can go on to seek jobs with firms in their supplier networks.

The advantages of the dual system are its ability to furnish trainees with a high degree of technical and practical competence, while the close involvement of employers in an essentially demand-led system ensures the relevance of the training to their market requirements. The labour market overall achieves a high degree of match between skill level and occupation, with international surveys showing only 18% of German workers consider themselves over-qualified for their jobs compared with an OECD average of one in four (OECD Employment Outlook 2011).

Among the system's disadvantages are its occasional inflexibility and an inability to forge close links with universities. Over the last decade manufacturing firms have found it more difficult to fill apprenticeship places, due to their increasing skill demands as well as a rise in the number of young people choosing to go to university instead, resulting in a fall in the average PISA attainments of technical apprentices. This raises the training cost for each recruit, prompting increasing numbers of smaller firms to defect from training arrangements, particularly in the east (Steedman 2005). Data covering the period 1980 to 2006 shows a decline in demand for apprentices from the industrial sectors and a rise in service type occupations. Industry still provides some 40% of all apprenticeships, but this is down from 50% in 1980 (Steedman 2010). The Federal government and Länder are trying to address this by devising 'transition' arrangements between schools and the VET programs, such as 'pre-apprenticeships' (Review of Vocational and Academic Training: A Learning for Jobs Review of Germany, OECD 2010).

The German training system contrasts with the UK, where workers are incentivized to acquire a set of general skills, as the UK's flexible labour markets provide fewer wage and occupational guarantees. The lack of specific skills training arguably entails large sections of UK industry becoming trapped in a 'low-wage, low-skills equilibrium', obliging them to pursue price-competitive product strategies as the lack of supportive institutions largely closes off the DQP path (Finegold and Soskice 1993). This could create problems for the future. Recent forecasts for EU countries indicate that most new jobs will be

created in the knowledge and skills-intensive occupations, while job numbers will fall for skilled manual workers (Cedefop 2010).

4. Firm co-ordination and innovation strategies

German manufacturing firms excel in the production of sophisticated engineering products requiring the deployment of long-term, patient capital and a highly skilled, co-operative labour force. Firms tend to specialize in well-established but relatively complex production processes and offer extensive after sales service with long-term links with customers. Examples of manufacturing sectors dominated by German firms include machine tools, engineering, engines, consumer 'white goods', cars and materials processing.

The ability to pursue quality-competitive DQP-type product strategies is underpinned by a range of institutions promoting 'strategic' (i.e. non-market) interaction between firms and other agents. This supports an innovation process that allows for steady, 'incremental' improvements to product lines. These elements of the German model are discussed below.

4.1 Innovation strategies

Incremental innovation is defined as 'competence-preserving', in that the product line is improved and upgraded, rather than deliberately rendered obsolete in order to explore new market opportunities. Incremental innovation tends to be more important for maintaining competitiveness in the production of capital goods, such as machine tools, where the challenge is to maintain the high quality of an established product line while devising piecemeal improvements to maintain quality control and hold down costs. Incremental innovation is often contrasted with the 'radical' innovation strategies pursued by many British and American firms, particularly in hi-technology sectors. Radical innovation is 'competence-destroying', in that firms may innovate themselves out of their previous tasks in order to seek out new product niches.

The close association of radical innovation with Schumpeterian processes of 'creative destruction', assumed to lie at the heart of any dynamic capitalist economy, has led some academic observers to conclude that the German model is exhausted and set to be eclipsed (Streeck 2008). The paltry returns to the substantial investments made by the Kohl government in an attempt to create thriving German software and biotechnology sectors is often seen as evidence of an 'innovation crisis' in the country (Adelberger 2000). The OECD has criticised the fact that innovation is '*...concentrated in fields of traditional strength on export markets*', with less activity devoted to hi-tech sectors than Germany's competitors (Improving the Capacity to Innovate. OECD Economic Surveys: Germany. OECD 2004: 117). Nevertheless, German technology firms have prospered in niche areas where they can specialize in broad 'platform' technologies, such as business software services (Caspar, Lehrer, Soskice 2009).

Moreover, spending on Research and Development (R&D) by German manufacturing firms remains extremely high. In 2010, R&D spending in manufacturing was €46.9bn, which equates to almost 86% percent of the private economy's total R&D expenditure, according to the Federal Statistical Office (Cost Structure Survey for Enterprises in the Manufacturing Sector 2009). R&D spending has increased steadily since 2000, by an

annual average of 3.8%, according to the German Institute of Economic Research ('Research-based Firms Perform Better', DIW Economic Bulletin 2012). The Federal government subsidizes R&D activity, to the tune of €1.9bn in 2010, and this was stepped up dramatically following the financial crisis as private sector R&D stalled. A 'High-Tech Strategy', launched in 2006, funnels significant funding to industry and includes institutional reforms to help start-ups, for example by amending the law on limited liability companies ('The High-Tech Strategy', Federal Ministry of Education and Research, 2006).

Since research-intensive firms enjoy considerably higher productivity than firms that do less research, these R&D efforts make an important contribution to Germany's spectacular performance in key manufacturing export markets. Nevertheless, the OECD has been critical of the reliance on direct government subsidies to support private sector R&D, and suggests a switch of emphasis to tax credits ('Structural Reforms to Lift Potential Growth in a Globalised World', OECD 2010).

German manufacturing firms innovate by systematically exploiting particular technologies in a variety of high value-added product niches. Much innovation is undertaken inside the firm by groups of workers with a high degree of technical skill who are endowed with considerable operational autonomy and take responsibility for specific tasks. An example is the system of 'quality circles' in the auto industry, pioneered in Japan, where teams engaged on the production line suggest and implement improvements to production processes largely independent of senior managers. This system requires extremely good labour relations, as so much innovatory activity is bound up in the 'tacit' (i.e. non-codifiable) knowledge held by employees and spread across networks of technicians, managers and scientists. Workers are therefore employed on long-term contracts and they also have considerable input into the management and strategic direction of the firm (see Section Two).

This tends to inhibit the pursuit of more high-risk innovation activity prevalent in faster-moving sectors of cutting edge technology. However, continued German domination of high-quality product niches, in which DQP strategies mesh with its pattern of institutional comparative advantage, indicates that the model is far from exhaustion.

4.2 Firm co-ordination

As well as effectively harnessing the input of their employees, German manufacturing firms exist within dense inter-corporate networks offering collectively-provided public goods that support incremental innovation.

As already noted, businesses in Germany are much more highly organized than those in the UK. Firms co-ordinate horizontally and vertically with others in the same sector over wage bargaining, technology transfer and diffusion within the industry; technical norm setting; training-standard setting and technical training. DQP manufacturing strategies, in fact, hinge on the ability of firms to develop relational contracts with other firms – including suppliers, customers and competitors – in order to participate in joint development, modification and customisation of machines and processes through technological exchange. Such collaborative frameworks create important information externalities for firms which would be extremely costly to provide individually (Ulrich 1995).

These activities may involve the exchange of internal, commercially sensitive information between firms competing in the same market. Independent monitoring of these exchanges is therefore extremely important to ensure fairness. This activity is undertaken by a range of organizations, including banks and professional engineering associations, as well as Chambers of Commerce, *Industrie und Handelskammertage* (IHK).

The IHKs are entirely private sector funded and underpinned by compulsory membership in a system of public law. Germany also has a 'craft' chambers system, *Handwerkskammer* (HwK), with 53 member chambers, and a network of 117 overseas chambers to support exporters. These associations are tied together into a well organized national framework, as most aspects of vocational training, employee representation and technology standards are normally governed by framework legislation enacted by central or regional government. The IHKs, for example, are coordinated at the national level by an umbrella body, the *Deutschen Industrie und Handelskammertages* (German Chambers of Commerce and Industry, or DIHK), which liaises with the economics ministry over industrial strategy. The DIHK has 80 member chambers, representing 3 million individual members.

Central government, however; plays an enabling, rather than interventionist, role in technology and innovation policy, for example by setting a framework for technology transfer through publicly-funded research institutes and universities. Much industrial and technical-oriented research is conducted outside the firm by a variety of university and non-university research institutions. The latter group includes: the *Max Planck Gesellschaft* (for basic research); the *Helmholtz Gesellschaft Deutscher Forschungszentren* (for the development of key technologies); and the *Fraunhofer Gesellschaft* (applied research). The German structure of industrial research specifically encourages networks of firms to collaborate on R&D at the pre-competitive stage. It also, somewhat in contrast to the UK, explicitly targets support for innovation by SMEs -and in both high and medium technology sectors (Rothgang et al 2011).

German firms enjoy broad leeway to cooperate in industry-wide standard-setting through the DIN standard. DIN provides a publicly-accepted framework for standards in private industry which, because it is not codified in law, is largely immune to state interference. The DIN framework is ideally suited to the DQP production system and is used by mass and customised producers alike. Building on its success, a 'fast-track' standard (EBN) for high-technology industries was created in the 1990s. The rigorous but flexible German system is widely-admired and arguably stands in contrast to the rather looser, 'lowest-common denominator', UK regime, based on BSI, whose drawbacks have encouraged many British firms to seek international standardisation (Tate 2001).

German policymakers understand that markets are frequently highly segmented, with firms interacting with a relatively small number of major competitors. Therefore, factors such as trust and co-operation can play an important role in competitive success. Inter-firm interaction is supported by a body of corporate law which is amenable to open-ended contracts - often characterised as 'high-trust' legal arrangements. The German legal system supports this by permitting a great deal of discretion in guaranteeing the confidentiality of commercially sensitive business and market information. As the legal standing of German business associations (and trade unions) are explicitly recognised in a system of public law, they are encouraged to create private agreements among themselves which are then legitimised by the state.

The peak industrial employer's association, the BDI, devotes considerable legal resources to enabling member associations to share information and coordinate their activities (Casper 2001). Although both UK and German manufacturers collaborate with other firms on product innovation, industry surveys reveal very different motives: while UK firms emphasise speed to market as a key reason for inter-firm collaboration and are more likely to sub-contract, German firms cite strategic priorities of risk and cost sharing and prefer collaborative relationships with rivals (Love and Roper 2004). Analysis of the biotechnology (Kaiser and Prange 2004) and pharmaceutical (Casper and Matraves 2003) industries illustrates how intra-sectoral collaboration on R&D and product development support the German system of incremental innovation, although both sets of authors acknowledge that this comes at the cost of limiting the ability of firms to adapt quickly to changing market conditions.

The government also sets the overriding competitive environment through competition policy. Generally, there is a strong requirement for open competition in the export market, but some avoidance of head to head competition in sub-branches of industry, particularly where open competition would militate against collaboration on training and technology transfer. An illustration of this is that the World Economic Forum ranks Germany 24th in the world for 'effectiveness of anti-monopoly policy' – the UK is in 9th place (Global Competitiveness Report 2012-13).

5. Complementarities in the German manufacturing sector

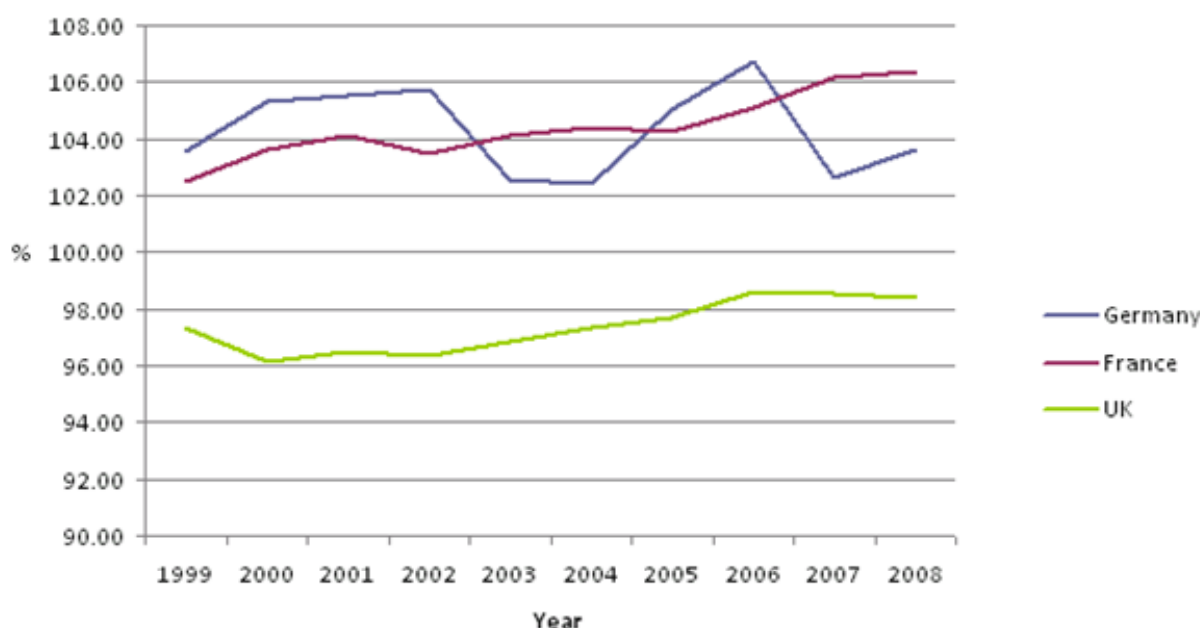
Having examined the institutional governance arrangements of each of the key constituent markets, and their difference from standard arrangements in the UK, one final key dimension needs to be explored: the tightness of their interrelations – the ‘systemic’ nature of the German manufacturing system – and the consequences of these interrelations. How, in other words, do the different institutional arrangements underpinning the German manufacturing industry work as an integrated system?

5.1 Institutional complementarities

The key concept in this regard, which helps us understand how the different sub-systems are mutually articulated, is that of *institutional complementarities*: two institutions are said to have positive complementarity-type effects if their joint presence increases the overall efficiency of the system – even if each of the sub-systems may be in what appears *prima facie* to be a sub-optimal position (highly regulated labour markets with centrally coordinated wage bargaining, for example).

Long-term investors such as banks, but possibly also conservative pension funds, are usually very willing to invest in the sustained provision of specific skills for workers and they will easily accept that regulated labour markets are a useful way of doing so. Nervous institutional investors such as mutual funds, in contrast, are very reluctant to sink capital into a long-term training project with uncertain (and often even longer-term) pay-offs, which ties their capital to the effort and skills of workers.

Crucially, once labour and product markets are linked in such systemic ways, the range of options for a company – and by extension all companies in the economy – in terms of the strategies adopted toward product markets is considerably narrower as well. Building machine tools in a competitive way, for example, requires that both employer and employee invest in skills that further a deep knowledge of the technology deployed and of the type of customers that would want to buy such complex capital goods. Specific skills and long-term capital are combined, in other words, in ways that produce important competitive advantages in relatively narrow market niches, where long-term, relationship-specific links between producers and consumers emerge (Amable 2003). Figure 3 below; indicates the degree of specialisation in Germany’s manufacturing sector, which is an indication of comparative advantage.

Figure 3: Export specialisation relative to total economy

Source: OECD STAN indicators 2009

The presence of several ‘mutually correctly calibrated’ institutions that govern different markets thus determines the efficiency of the overall institutional framework. This argument for the existence of ‘institutional complementarities’ implies that for a framework to have the desired strong effect, the constituent institutions in the different markets – between labour relations and corporate governance, labour relations and the national training system, and corporate governance and inter-firm relations – reinforce each other.

In countries such as Germany (and with it much of North-West Europe), long-term employment strategies, rule-bound behaviour and the durable ties between firms and banks that underpin patient capital provision predispose firms to the kind of ‘incremental innovation’ in capital goods industries, machine tools and equipment of all kinds characteristic of German manufacturing. The system operates to maximize the mutual gains from co-specific assets – assets such as skills and technology, which, in contrast to generic assets, require each other to realize their potential.

As a result, the links between labour and capital are organized very differently in Germany from many other economies. Within companies, both large and small ones, workers are involved in operational and strategic decision-making at many different levels, from the shop floor via works councils and (separately) trade unions to an almost equal presence on the supervisory board (roughly equivalent to a Board of Directors).

There are, for the purposes of this paper on the institutional context of powerful German manufacturing, two key implications of this notion of institutional complementarities. The first is, in a sense, why we direct attention to Germany today. Its institutional make-up, which is at the basis of sophisticated skills, patient capital, dense inter-firm networks, resulting in the production of complex medium-tech capital and consumer goods, could be construed as ‘comparative institutional advantage’. German manufacturing success is the result of this interaction between different sub-systems, all guided by the same institutional principles, which allow them to move in tandem.

The second question is related to the possibilities of transferring elements of the system into economies that operate on fundamentally different principles, e.g. where the state plays a larger role in steering investment and credit (as in France, Japan and South Korea after WW II), or where transparent market relations prevail in labour and capital markets (as in the UK and the USA). Put differently, given the complementarities between the institutional arrangements governing different markets, to what extent is institutional ‘cherry-picking’ possible?

There are in principle two very different answers to this question. The first essentially precludes such forms of institutional transfer, because it would, in an expansive reading, be necessary to transfer not just the element that is desired, but a whole array of background conditions and institutions as well – many of which are the product of several decades and centuries of adjustment and conflict and, therefore, are not easy to replicate. France since the second oil shock and Central Europe since 1989 both give an indication of the difficulties of building a new institutional framework that introduced key elements of the German system. In both cases, top-down emulation of the institutions governing the German industrial sectors failed, to a large extent because none of the other supporting elements were present: banks had developed weak monitoring capacity or were simply non-existent in that role, labour unions were weakly organized in companies or absent, and local development agencies failed, in the absence of local chambers of commerce and similar organizations that aggregate firm interests, to engage firms in a long term, strategic way. Building a sophisticated manufacturing system thus depends on the existence of several pre-existing institutions and organization, which, themselves, are built on what we could loosely call proto-institutions.

The second answer is more permissive, building on the notion that not all background institutions are equally necessary and that functional equivalents might exist for those that are. In a careful comparison of German and Swiss institutions, Börsch (2007) concludes that the high value-added manufacturing associated with both countries might be obtained with more liberalised labour markets than had been considered necessary from the standard institutionalist perspective (this point is explored in greater detail below).

Similarly, Goyer (2007) argues that the disintermediation of capital provision has not necessarily led to a collapse of long-term, patient capital: pension funds, which require a stable, long-term return on their investment (as opposed to mutual funds, who operate on a considerably shorter time horizon), are disproportionately more active in the German economy.

Both these examples suggest that the degrees of freedom are, perhaps, higher than the ‘tight constraints’ view suggests. However, it is important to bear in mind that both Switzerland and Germany under financial globalization have retained many of the proto-institutional frameworks that support sophisticated product market strategies. Swiss firms exhibit a high degree of coordination – much higher than we usually find in countries such as France, Italy, or, especially, the UK. And long-term institutional investors are, one could argue, exploiting this particular comparative advantage of German firms when they decide to invest there: there is no need to force German firms to change strategy, since short-term manufacturing strategies are easy to find elsewhere on the globe.

In sum, we are of the view that institutional complementarities are especially important for understanding the success of the German manufacturing sector and that these

complementarities have to be seen as more or less hard institutional constraints. They may not determine what is possible, but they certainly suggest strategies that are impossible because they are incompatible with the underlying institutional framework.

5.2 The *Mittelstand*

While large manufacturing firms are responsible a large share of German exports, ranging from 30% to over 50% depending on the sector, an equally important part of exports is linked to the dense network of small, usually family-owned companies collectively known as the *Mittelstand* – literally the ‘middle strata’, although that translation hardly does it justice, considering that much of German large-scale manufacturing would find it hard to survive without them.

These companies are deeply rooted in their local communities, specialise in a single or a very small number of high-end products, and do that, on the whole, better than most of their competitors. They rely on highly skilled workers, who have usually been with the company for a long time, and on the apprenticeship system as a source for replenishing skills. Their financial situation is such that they attempt to remain out of debt, relying on retained earnings for developing future strategies, or tap into a large network of local savings banks when the need for extra cash arises. The key component of their success is the relentless focus on a small number of high-quality products and strong, long-term links with an end manufacturer (for those who produce intermediate goods) or an aggressive international strategy (Streeck 1995).

It is hard to imagine this sector without the institutional framework that underpins the rest of the German manufacturing export sector. Like the large firms, they rely on apprenticeships for skill formation, peaceful labour relations, with or without the cooperation of labour unions but always involving an employee forum such as the local works council. When necessary, they also rely, possibly more than large firms, on local banks when necessary (Matraves 1997).

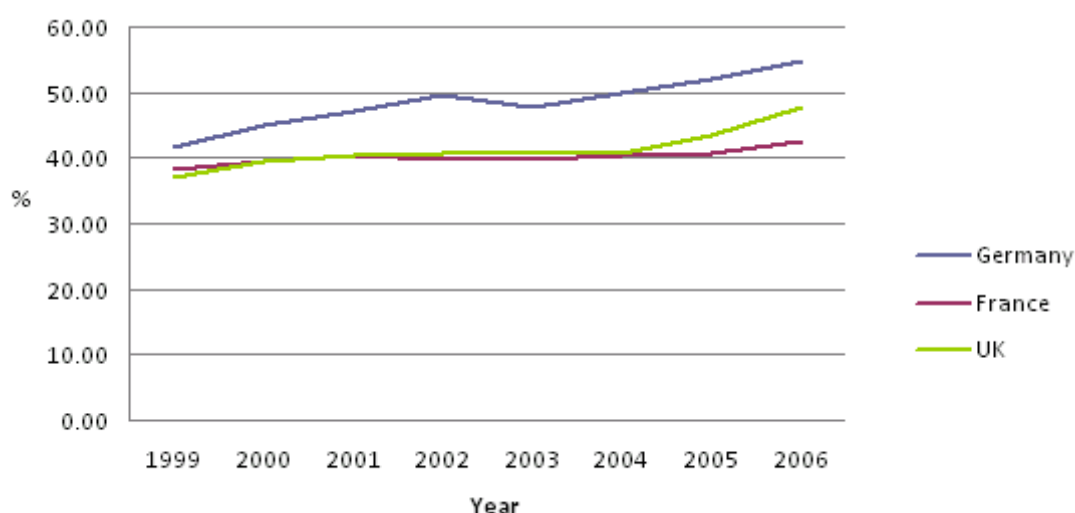
As a result of this reliance on key elements of the German institutional framework for manufacturing they thrive there, while they usually are a considerably less vibrant part of the economy in other large European economies such as France and the UK (the small northern European economies often have an industrial structure that mirrors Germany’s, reflecting their relatively similar institutional make-up). According to the German Chamber of Industry and Commerce, the DIHK, there were about 3.5 Million of these firms (with fewer than 500 employees) in 2011, employing about 80% of the German industrial workforce, and contributing over 50% to German GDP.

Comparable figures for France are hard to come by – not least because France has only recently recognised the equivalent of the *Mittelstand* as a statistical category – but a consensus figure is that there are less than half of these types of companies, with a similar ratio for employment (which is concentrated in the low 1-9 workers segment) and turnover, which is hovers between 15% and 20% of GDP (Ernst & Young 2012). Importantly, French small firms of this type are often dependent on a small number of large firms for whom they act as suppliers and very few have autonomously developed export markets. In the UK, SMEs comprise 57% of manufacturing firms, accounting for 33% of turnover (Business Population Estimates 2012, BIS).

6. Future trajectories for German manufacturing

At the moment, in late 2012, there are very few reasons to assume that the German manufacturing sector will soon face significant adjustment problems. By all standards, the two deep recessions that these sectors faced in the early 1990s and the 2000s were far more important in terms of the sense of doom that had conquered the sector: inviting disbelief today, German manufacturers and policy makers raised, in both instances, the genuine spectre of a dramatic decline of the manufacturing sector. In both these periods, adjustment was guided by the institutions that we analysed earlier: the training system was revamped, R&D investment beefed up, and employers and trade unions explored new elements in the industrial relations system that retained the beneficial elements while reducing the negative impact of others. In a sense, the German manufacturing system is extremely well-equipped to deal with such challenges, based as it is on broad co-operation among all actors in the economy – banks, employers, firms, labour unions and workers.

Figure 4: Export share of manufacturing production



Source: OECD STAN indicators 2009

6.1 Threats to the German manufacturing system

Yet there are dark clouds on the horizon. Some of these are beyond the direct control of employers and labour – the crisis of the euro, for example, skirting a third recession in less than six years and heralding anaemic growth across the continent, is bound to affect the highly export-dependent German manufacturing sectors deeply, especially those that concentrate on the EU and wider Europe. Yet, while important, Germany's export sector has, to some extent, neutralised part of that particular threat by turning to markets outside the EU, especially China. China may be the world's main exporter, but Germany is building its factories and for the time being, as the developing world grows faster, German exports will benefit from that process.

More problems may reside in the changing socio-economic landscape of Germany. Higher service employment, lower unionization rates and a dramatic increase in female employment will influence the power that manufacturing yields in the political-economic structure of the country. Employment in the service sectors and (all other things equal) female employment have skill profiles that are very different from standard specific-skill based (predominantly male) manufacturing skill profiles.

The training system may have worked particularly well for manufacturing; however it is unclear how well it performs in services, which require relatively low-level general skills or where skill profiles are shifting faster (as in the ICT sectors) than the relatively slow training programmes can accommodate.

The success of German manufacturing depends critically on the (sometimes redundant) provision of public goods, of which training is arguably the most important. Over the last two decades, however, training efforts of firms have fallen quite dramatically, from over 700,000 annually in 1992 to below 600,000, reflecting the diminished growth of jobs in the manufacturing sectors since the crisis of the early 1990s (and despite the recent growth in jobs in the sectors). Whatever the causes, such a reduction leads, as a result to the compound effect of systematically lower training numbers, to a smaller pool for companies to tap into in the future.

One of the key problems that the German manufacturing sector is likely to face in the near to medium future is one of skills. For all the reasons above, numbers of workers and companies engaged in vocational and technical training are falling quite rapidly, and good jobs are now also found outside the stable manufacturing sector.

In addition, a two to three-year training programme is eminently feasible in stable sectors, where product innovation is slow (incremental) and builds on existing skills and links with suppliers. However, as product life cycles shorten – mainly as a result of newly industrializing countries entering the market, such long-term training systems invariably come under stress.

Both large companies and the Mittelstand thus face a situation in which the production of skills will have to be managed more carefully than in the past. If the fall in apprenticeships continues, the government, both in Berlin and in the German member-states, may be asked to play a more active role in skill provision, actively through the provision of training centres where the private sector appears unable to produce results, or more passively through taxes and subsidies that make such jobs more attractive.

These problems are, to some extent, related. The crisis of the euro can also be seen as a crisis of a monetary union with a magnificent export sector in the north that exported to the south of the continent, thus exacerbating current account imbalances, budget deficits and private debt overhang. The rise of female employment also produces a counterbalance to the inherent financial conservatism of German households in the face of uncertainty: two incomes reduce the need to save as a shelter against weaker employment protection and pensions. And the rise of the service sector is to some extent an answer to the increased sophistication of manufacturing processes, which now require technical skills beyond the normal levels provided in the vocational training system.

The future of the German manufacturing system is, therefore, far from secure. While the biggest threat it faces is probably not the collapse of its export markets as a result of

sluggish growth in the developed world, there are a series of related problems that need to be addressed. And whereas such adjustment problems could easily find a solution within the existing framework in the past, it appears as if the current batch may be harder to accommodate within the current framework, precisely because they follow from elements that are new and, to some extent alien, to the German export manufacturing system.

Because the country is an exporting economy, Germany's manufacturing sector will remain important. As long as the world needs German products and as long as Germany can provide those at an affordable price – both assumptions that have held true in the past – Germany will find a way to face the coming crisis. However, as a result of adjustment processes elsewhere in the economy, Germany's manufacturing sector might be facing a more uncertain environment in terms of skills and finance than it did in the past. And it might well be, as we saw with human resources policies instigated to stabilize the German labour market during the latest crisis that the government will carefully play a more important role, loosely articulated with the existing institutional framework.

7. Are there policy lessons for the UK?

Despite talk of the death of manufacturing, the UK still possesses many world-beating industrial companies, such as Rolls Royce, JCB and GKN. But it also has a large number of low-value added firms, competing on price rather than quality and highly vulnerable to growing competition from low-cost developing world producers climbing inexorably up the value chain. The German industrial model inevitably offers policy-makers here an attractive alternative path of adjustment because it offers a model based on high skill levels, superior export performance, a long-term strategic investment outlook and industrial harmony. But are successful elements of the German model transferable to the UK?

7.1 Developing co-ordination in an unco-ordinated economy

UK policymakers have looked abroad previously for policy lessons: French-style indicative planning was tried in the 1960s; the 1975 Bullock Report suggested moves towards co-ordinated wage bargaining systems along German lines; and continental 'stakeholder capitalism' was briefly fashionable in the 1990s. But these have not flourished and the thrust of policy since 1979 has been to reinforce the liberal-market characteristics of the UK economy (Crafts 2007). In an era of globalisation and international trade and capital movements, the institutional landscape of UK capitalism provides the country with comparative advantages in services (especially financial services) and some innovative hi-tech manufacturing sectors; but also in much flexible, low cost manufacturing.

Logically, the goal of policymakers should therefore be to preserve market shares in services and hi-tech industries while shifting gear to capture a larger segment of the medium and upper-medium tech industrial sectors currently dominated by Germany and Japan. This would entail developing capacities for high quality, semi-customised production techniques, perhaps accompanied by measures to close off the 'low road' option for firms currently choosing to compete on flexibility and price.

However, as this paper has argued, DQP capabilities in Germany's manufacturing industry are underwritten by several important economic relationships: companies securing long-term relationships with their owners; unions and employer associations playing an important role in the regulation of labour markets; firms being closely integrated into training systems and cooperating with each other through powerful industry associations. As these institutions are currently either absent or underdeveloped in the UK it might appear, at first glance, that these capacities may be difficult to foster on a broad platform within UK industry.

A critical obstacle to developing capacities for co-ordination from a low base is that economic institutions are complementary – that is, they depend on interlocking institutions in other spheres in order to function. Quite radical reforms in a number of areas would therefore need to take place simultaneously. For example, it may be pointless developing long-term labour market relationships and training contracts in the absence of simultaneous corporate governance reform aimed at fostering longer-term investment horizons to reassure workers against skills redundancy. Policy development

needs to take account of these complementarities and approach reform in a co-ordinated manner.

Politically, such a reorientation of industrial policy would probably require a broad-based coalition of employers, trade unions, financiers and policymakers behind it to succeed. Such coalitions have not proven particularly durable in the past. It would also be important not to destroy, or significantly undermine, those institutional capacities – such as flexible labour markets and a regulatory regime tolerant of takeovers – which support the UK's success in radically-innovative high technology sectors.

Realistically, therefore, institutional reform in the UK would need to work with, rather than against, the grain, of an economic system that is primarily co-ordinated through markets (Coulter 2011). Building inter-firm co-ordination in 'low-trust' systems such as the UK is notoriously difficult as firms lack the ability to create stable agreements in the absence of powerful industry associations to come to their aid in disputes. The high degree of business co-ordination in Germany is, in part, a historical legacy of its powerful medieval guild system, which survived attempts by the Allies to dismantle it after WWII (Herrigel 2000), and is not therefore easily replicable. The preference of UK firms has generally been towards looser, voluntary arrangements with little or no intervention from government beyond the provision of basic public goods (Wood 2001). The organisation of labour in the UK is also problematic, as UK trade unions are highly competitive with each other and wield power in certain sectors but lack the cohesion for more proactive strategies so employers are likely to block an enhanced role for them in wage bargaining or corporate restructuring (Crouch 1992).

On the other hand, as noted earlier, other countries – notably Switzerland – have been successful in pursuing high-value added production strategies with labour market and corporate governance systems that are closer to the UK than the German model in key respects. Börsch claims that Swiss firms in certain sectors are able to build sufficient coordination to support incremental innovation and DQP, subject to two conditions: first, they invest heavily in high-quality training; second, and more problematical for the UK, the more shareholder-oriented corporate governance system in Switzerland belies a relatively concentrated ownership structure that obstructs a market for corporate control. These two elements permit the kinds of commitments by workers and management necessary for DQP (Börsch 2007).

Nevertheless, recent empirical work in micro-economics and game theory suggests that competitive markets are not necessarily inimical to building trust, provided that a minimal level of private information about competitors and potential collaborators is available to them (Huck et al 2012). This suggests that stronger business associations, which play a critical role in the German manufacturing industry as conduits for information and best practice, could provide an institutional 'trigger' for the UK to foster more co-ordination over things like demand-led vocational training, technology transfer and product development. They could also oversee, in partnership with central government, an overhaul of supply chains and provide more targeted support to medium-sized business – two areas currently seen as critical weaknesses by the Department of Business, Innovation and Skills and the CBI.

7.2 Policy innovations for the future

Policymakers in the UK are currently examining the organisation of business to see whether better vertical and horizontal coordination by firms could improve economic outcomes (Heseltine 2012). The institutional framework for this is already in place, at least in embryo, as the UK possesses a long-standing network of Chambers of Commerce which provides business support and advice, and the government has recently introduced firm-led Local Enterprise Partnerships (LEPs) to disburse state-provided development funding and develop strategic planning (Autumn Statement, HM Treasury 2012).

Such organisations – Chambers and/or LEPs – could potentially play a much greater role in co-ordinating firms' activities than they do already. However, for this to happen, they would need to be revamped and given significant statutory powers and responsibilities. As things stand, the Chambers, although business-run, suffer from low membership, while the LEPs are regarded as creatures of central government and have already been the subject of turf-wars between business lobby groups. The fragmentation of business interest representation in the UK has been an issue of concern since the Devlin Commission of 1972, but there has been little effective action.

A major obstacle to Chambers of Commerce assuming an effective coordinating role is their voluntary membership basis. In Germany, membership of the appropriate industry Chamber is compulsory in order to prevent free-riding. The recent Heseltine review has suggested that membership of UK Chambers could be made compulsory, but firms are likely to oppose this. Thus, in the absence of a compulsory element, an essential requirement for effective sectoral coordination would be for trade associations to be in a position to offer substantial selective benefits to member firms, to the extent that self-exclusion from such networks would entail significant costs.

An obvious area that might benefit from greater collaboration among firms is vocational training as, despite repeated interventions by governments, the UK still suffers from a serious under-provision of skills. A model for reform is the Construction Industry Training Board, which oversees intra-sectoral co-ordination of training in the building industry funded through a compulsory training levy. Groups of employers in other business sectors could also benefit by collectively setting training goals and overseeing provision through business associations. This would offer the benefits of a demand-led training system while helping to avoid free-riding. However, given the uncertainties workers face in the UK's flexible labour markets, trainees themselves would also need greater incentives to commit to enter the system. This could be achieved by sharply increasing the number of Advanced Apprenticeships at the expense of less demanding qualifications and linking these more explicitly to membership of and registration through professional bodies to guarantee their status.

Central government also retains substantial scope for intervention in the sphere of finance and corporate governance, given the size of its balance sheet and critical role in setting the overall competitive and legal environment for firms. Recent proposals for a 'Business Bank' to increase lending appear to be explicitly based on Germany's KfW investment bank (Vince Cable, Statement to Parliament, 11th September 2012). However, this example of institutional borrowing may prove overly interventionist for UK businesses. The CBI has advocated instead an aggregation platform which would bundle

loans to kick-start a bond market for medium-sized businesses and provide alternatives to traditional bank financing.

The recent report into the operation of UK equity markets by Professor John Kay is critical of its endemic short-termism, arguing that this reduces investment (Kay 2012). Kay has recommended reform of equity markets to prioritise Voice over Exit, in other words to secure closer involvement between asset managers and the companies they invest in through adjustments to corporate governance regulation. The LSE's Growth Commission has also suggested regulatory changes (for example over equity voting rights) and tax reform (reducing the biased treatment of debt finance) in order to lengthen investment horizons ('Investing for Prosperity' Report of the LSE Growth Commission 2012). Such action, if carefully designed, could improve the supply of patient capital to the parts of industry which need it while, ideally, not interfering in the ability of technology firms operating in fast-moving markets to redeploy capital swiftly to respond to rapidly changing market conditions.

In summary, it would not be practical for the UK to adopt wholesale the institutions for co-ordination of the German industrial model, and it should probably not try. Nevertheless, the financial crisis and faltering emergence from recession has laid bare the limitations of unfettered markets, and there may be substantial policy lessons to be learned from Europe's manufacturing powerhouse.

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