

Global value chains and international competitiveness

The rapid development of computer and communication technology has led to production processes becoming increasingly internationally fragmented. What parts of the global value chains are located in Sweden and how is the Swedish labour market affected? Are there prospering futures for tradable services in Sweden? Is the Swedish R&D paradox an illusion?



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Foreword

The rapid development of computer and communication technology has meant that information and communication costs have fallen drastically. This has led to production processes becoming progressively divided up and nowadays they take place in a number of stages and in different countries. This increase in international fragmentation therefore allows/forces countries to specialise in different activities within the production process (R&D, production of input goods, marketing, etc.). This means that comparative advantages are no longer determined in terms of industries but rather in terms of activities or business functions. This report is part of the Swedish Agency for Growth Policy Analysis' commission from the Ministry of Enterprise, Energy and Communications to contribute to increased knowledge of global value chains.

The aim of the report is to try to identify, map and analyse comparative advantages within the trade and investment areas in industries, products and activities. What parts of the global value chains are located in Sweden and how is the Swedish labour market affected? What significance does this have for Swedish industrial and growth policy?

For the developed countries within the OECD, substantial parts of the manufacture and assembly within the value chains have been relocated to low-wage countries. The more value-creating parts, particularly at the beginning of the value chains, for example R&D and design, but also at the end of the value chains, however, still largely remain in the developed countries.

In particular in that part of the service sector that is exposed to international trade, there are many industries where the proportion of skilled labour is very high, for example in technical consulting and IT and communication services. Sweden and many other developed countries with relatively good access to skilled labour seem to have comparative advantages in these parts of the economy.

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Summary

The emergence and increased importance of global value chains has meant that the production process for most goods and services has become increasingly fragmented and geographically dispersed. For the developed countries within the OECD, this has involved that substantial parts of manufacturing and assembly within the value chains have been relocated to low-wage countries. More value-creating parts, particularly at the beginning of the value chains, for example R&D and design, but also at the end of the value chains, however, still largely remain in the developed countries.

This is a pattern that emerges when we study the Swedish multinational companies and how the composition of the workforce at the parent companies in Sweden is affected when they increase activity in their foreign subsidiaries. The proportion of skilled labour then increases at the parent company and the more routine tasks become fewer.

A growing relative demand for skilled labour due to the development described above and in combination with skilled-biased technological change seems, however, to have been counteracted by the substantial expansion of higher education in Sweden in recent years. Apart from a small increase in the relative wage for labour with post-secondary education at the end of the 1990s, this has remained largely constant over the past fifteen years.

The increasingly important role that service-related parts have come to play within the framework of the global value chains in the more developed countries becomes evident when we divide the Swedish economy into three parts: tradable services, non-tradable services and manufacturing. Here we find that within that part of the Swedish economy that is exposed to international trade, tradable services has over the past twenty years grown at the expense of manufacturing.

From a regional perspective, it is worth noting that tradable services industries are concentrated to regions with dense populations and a high proportion of skilled labour. The location pattern of manufacturing is related to neither the size of the region nor the human capital intensity.

It is also notable that the share of skilled labour has increased faster in the tradable sectors than in the non-tradable service sector. One possible explanation is that in these highly internationalised parts of the economy there has been a particularly strong trend towards less skilled jobs disappearing at the same time as more skilled jobs are created.

A person's job also seems to involve a wage premium for those who work in industries and occupations that are tradable; these people's wages are almost 12% higher compared to those who have similar education and other observable characteristics but who work in other industries and occupations. The premium might partly constitute some form of compensation because the probability of losing one's job is higher in the tradable industries and the loss of income more noticeable for those who lose their jobs in these industries. On the other hand, the probability of finding a new job is greater for people who were employed in tradable services when they lost their jobs than for those who had worked in non-tradable services and in manufacturing. The adjustment costs due to structural changes in the tradable part of the economy seem generally to be higher for those who are displaced in manufacturing. The probability of losing one's job is less, it is true, but the loss of income is greater and the probability of being re-employed is lower for people being displaced in manufacturing than in tradable services.

Finally, it is clear that the long-debated Swedish R&D paradox might very well be able to be explained within the framework of an argument based on global value chains. Swedish multinationals tend quite simply to locate their R&D activities in Sweden and their manufacturing facilities elsewhere. That what might at first glance appear to be a paradox can very well be explained by means of a simple economic model underlines the importance of a well-founded analysis being made of a perceived problem before beginning to consider conceivable policy measures. Another lesson that can be drawn from the discussions concerning the R&D paradox and the increasing importance of global value chains is that it has become much more difficult to identify international competitiveness using traditional measures of competitiveness based solely on production values.

1 Introduction

The rapid development of computer and communication technology has meant that information and communication costs have fallen drastically at the same time as transfer has become more reliable. Physical transportation costs have also decreased, although by no means as dramatically. This progress has made it easier for companies to divide up their value-creating activities to a greater extent, from development of a product, for example research and development (R&D) and design, to manufacturing, distribution, marketing and end customer support (the value chain). It has also meant that it has been easier to exploit differences in costs between countries in different activities by spreading the operations within the value chains internationally; the value chains have become increasingly global.

In the report we discuss the global value chains' emergence and importance and how they have influenced and changed the nature of international exchange in recent years. The contribution of different activities to a product's added value varies within a value chain. Technical advances and the possibility to shift out certain stages of the value chain to other countries (offshoring) has caused the cost of these activities to fall and their contribution to the total value added to also be reduced. One significant factor behind the size of an activity's contribution to the total value added is the degree to which skilled labour is used; the higher the proportion of skilled labour (i.e. the higher the human capital intensity) the greater the activity's contribution to the value added tends to be. The human capital also seems to play a key role for other reasons, partly because it is relatively sticky and partly because it seems to have a positive impact on surrounding operations.

The share of skilled labour is also crucial as regards disposition to relocate operations to other countries. Within the framework of a simple offshoring model, we describe how the relative demand for skilled labour is influenced by offshoring both in the country from which activities are moved and the country to which they are relocated. With this model as the starting point, we then discuss how offshoring to low-wage countries has affected the relative demand for skilled labour in Sweden over the past fifteen years. Higher education in Sweden has grown substantially over the same period, which has led to an increase in the relative supply of skilled labour. By studying how the relative wage for skilled labour has developed since the mid-1990s we try to say something about the relative importance of these factors.

The companies that have driven the international fragmentation process furthest are probably the multinationals and can therefore be considered to be of particular interest to study if one wishes to analyse the importance of the global value chains in general but also to get a picture of in what types of activity Sweden has comparative advantages today. In the report we study Swedish multinationals and how the composition of the work force at their parent companies in Sweden is affected when they expand their subsidiaries in other countries. Is it activities that use a large proportion of less skilled labour and where more routine tasks are performed that are relocated abroad or is it more skilled kinds of work?

One issue closely linked to the multinationals and global value chains is the so-called "Swedish R&D paradox" that has been the subject of much discussion over the years. Why is it that in an international comparison R&D intensity – R&D as share of value added – in Sweden is so high at the same time as the share of high-tech production in Sweden is not particularly great? The answer lies quite simply in the fact that Swedish multinationals

have located a large part of their R&D in Sweden while a significant portion of their manufacturing takes place abroad. The R&D paradox highlights a problem that has become more accentuated as global value chains have become more common, viz. identifying international competitiveness using measures based solely on production values, e.g. Balassa's "revealed comparative advantage". In the present report these difficulties are illustrated by means of an example of how this can lead to misinterpretation of China's comparative advantages.

The increase in international trade within the framework of global value chains has meant that international exchange takes place nowadays on a more disaggregated level. It has also been claimed that trade in services has also increased in importance. We give an indication of the latter in the report by dividing up that part of the Swedish economy that is exposed to international trade in manufacturing and in tradable services and studying the development of employment in these parts over the past twenty years, where we found that tradable services has expanded at the expense of manufacturing. The proportion of people employed in non-tradable services on the other hand has remained relatively constant over the same period. One characteristic trait of tradable services is that the share of skilled labour is considerably higher in tradable services than in manufacturing and non-tradable services. With this as the starting point, we argue in the report that one explanation for the shifts in employment from manufacturing to tradable services in that part of the Swedish economy that is exposed to international trade might be the substantial increase in the supply of skilled labour in Sweden since the mid-1990s.

We also note that a wage premium is paid in industries that are exposed to international trade; wages are higher for people in these industries than in other industries for people with similar education and other observable characteristics. Is this because jobs in these industries are more exposed to international competition and thus less secure and the premium is compensation for this? In the report we investigate whether the probability of losing one's job is greater in these industries, whether the people who have these jobs have a poorer wage development when they are displaced compared to other displaced workers, and whether they have less probability of re-employment. We find that adjustment costs are to a degree higher in tradable industries, particularly in manufacturing, and that the higher wages there might to a certain extent be a compensation for this.

There also seems to be great variation between different regions as regards how large a proportion of those employed work in tradable services and how large a proportion are employed in manufacturing. We find that the tradable service industries seem to be concentrated to large regions with high population density and high human capital intensity. We can see no corresponding pattern when it comes to manufacturing. We discuss what may lie behind this location pattern and what consequences it might have for future structural changes.

The report is structured as follows. In Section 2 we discuss the emergence and importance of the global value chains. How falling trade costs in the form of lower transport costs and of fewer and lower barriers to trade to begin with meant that production and consumption were separated (1st unbundling). How the rapid development of information and communication technology later made it possible to carry out different activities in the value chains in different places around the world to an increasing extent (2nd unbundling). In Section 3.1 we present a theoretical framework for global value chains that we then use to analyse how offshoring of various activities impacts on the relative demand for skilled labour. In Section 3.2 we describe the proportions of the total value added that different

parts of the value chain represent (the smile curve). In Section 4.1 we study the impact of shifts in the relative demand for skilled labour, depending on increased offshoring to low-wage countries in combination with technological change, and increases in the relative supply of skilled labour, as a result of the expansion of higher education, on the development of relative wages between skilled and less skilled labour in Sweden over the past fifteen years. In Section 4.2 we investigate what kind of activities remain within the parent company in Sweden when Swedish multinationals employ more people at their overseas subsidiaries. Section 5 looks at the Swedish R&D paradox. In Section 6 we focus primarily on that part of the service sector that is (or might potentially be) exposed to international trade. What characterises the tradable service sector, how has it developed and how is it distributed regionally? Section 7 contains concluding remarks, among other things, about the significance of the emergence of global value chains and some policy implications.

2 The emergence and importance of global value chains

Falling trade costs (lower transport costs and fewer and lower barriers to trade) led to begin with to production and consumption being able to be unbundled. When the costs associated with coordinating activities also fell dramatically as a consequence of the revolutionary development of information and communication technology (ICT), it became possible to a greater extent to divide production into different activities/stages that could be carried out in different places. Below follows a summary of what Richard Baldwin has called the first and the second unbundling and what they have meant as regards the emergence of global value chains.

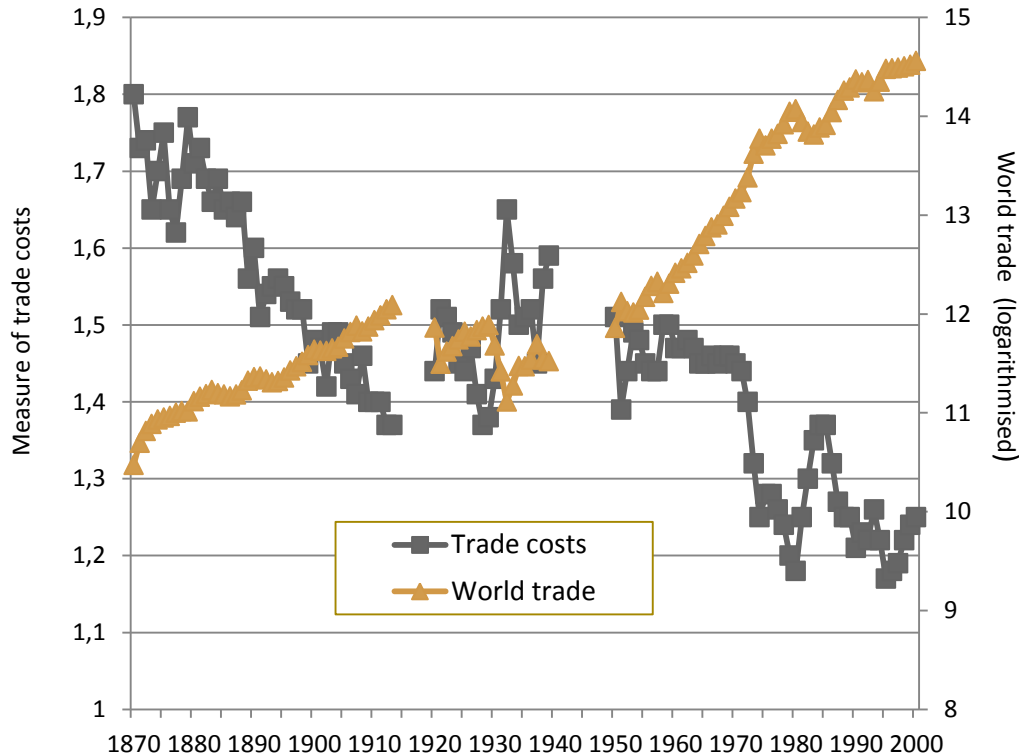
2.1 Separation of production and consumption (1st unbundling)

Before the first wave of globalisation at the end of the 19th and the beginning of the 20th century (before the outbreak of the First World War in 1914), goods and services were largely produced and consumed in the same place. The main reason for this was poor transportation possibilities. The expansion of the railway network and the advent of steamships in the mid- and late 19th century entailed considerable improvements as regards transportation and made it possible to separate production and consumption to an increasing degree. In combination with advantages of scale and comparative advantages this also became economically profitable.

It meant that economic growth during this period began to accelerate in the USA, Western Europe and Japan and international trade in goods increased significantly. Alongside the increase in international trade, production of goods tended to an increasing degree to be concentrated to factories and industrial areas. This was due to the fact that production processes were often complex and composite and proximity between activities was necessary to reduce coordination costs between different stages of production.

This development is illustrated in Figure 2.1, where falling trade costs over the period from 1870 to 1913 co-vary with increased world trade. During the interwar period we see that world trade stagnated as a result of increasing protectionism, which among other things manifested itself in greatly increased customs duties in connection with the great depression of the early 1930s, the cessation of fixed exchange rates resulting from the abolition of the gold standard, and greater difficulty in obtaining commercial credits. During the post-war period from 1950 on, trade costs once again decrease. This is partly a result of the substantial reductions in customs duties that were made within the framework of the GATT negotiations during this period but is also due to the lower costs brought about for example by container traffic. As can be seen from Figure 2.1, world trade increases once again during the post-war years. Another important source of this development is the ICT revolution that began in the mid-1980s.

Figure 2.1 World trade and trade costs, 1870-2000.



Remarks: The trade costs are calculated on the basis of a gravity model and are the difference between the costs that the observed trade flows imply and a hypothetical reference point with frictionless trade (See Jacks et al. 2011 pp. 187-189 for a detailed description). This means that the measure is expected to capture the combined effect of customs duties, transport costs and other macro-economic factors that have a restricting impact on the international integration of markets. The figure shows a non-weighted average of the trade costs for the 130 country pairs upon which the analysis is based. World trade is the total trade between these country pairs and includes on average 70% of all trade during the period studied, i.e. 1870-2000. World trade is measured in USD millions in 1990 prices.

Source: Jacks, Meissner and Novy (2011) and Baldwin (2012).

2.2 Division of production into activities/stages (2nd unbundling) and offshoring

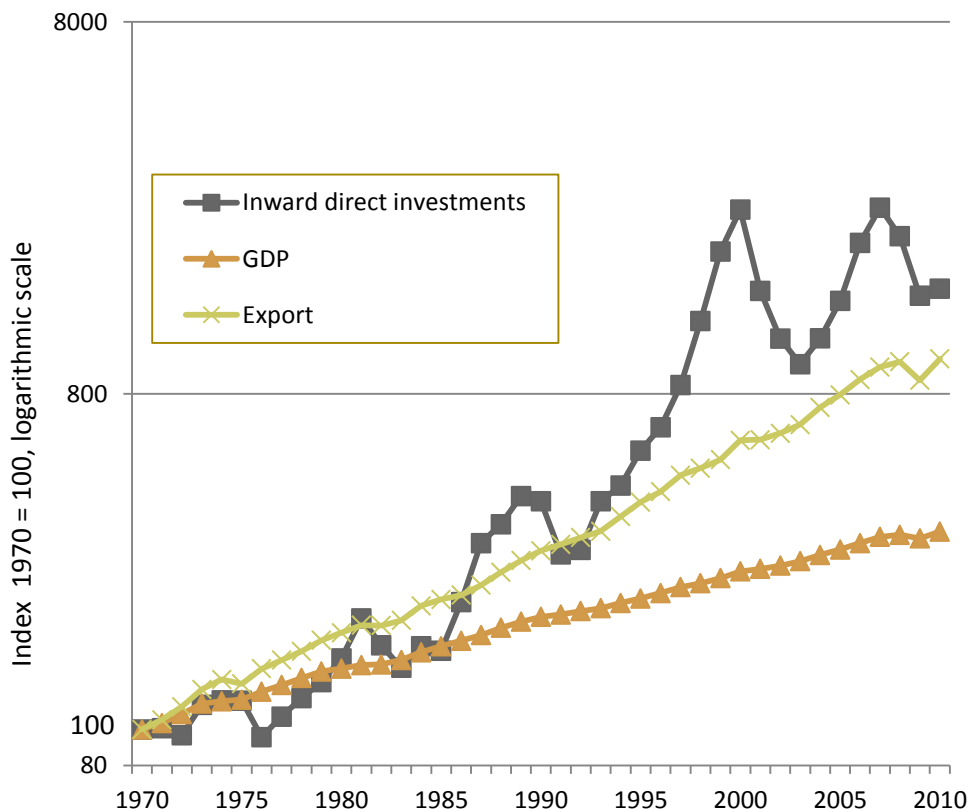
Since it was often complicated and difficult to supervise exchange of input goods, technology, employees and information to reduce costs and risk production activities/stages came to begin with to be gathered together under one roof in a single factory. The ICT revolution that led to a drastic decrease in information and communication costs made it much easier to coordinate different activities from a distance. This means that production activities that were earlier carried out close to each other could now be spread geographically and not least the large wage differences between developed and less developed countries led to this division proving to be profitable. The ICT revolution in other words made it easier during the second wave of globalisation, at the end of the 1900s and during the early 2000s, to combine technology from the developed countries with cheap labour in the less developed countries, which in recent years has accelerated international transfers of technology from developed countries to less

developed countries. Another strong contributing, and complementary, reason for this development is that many less developed countries have in recent years become increasingly market-oriented; China after Mao's death in the mid-1970s is perhaps the most prominent example.

With the emergence and increasing importance of the global value chains interest has shifted from sectors/industries in trade and industry to production activities within the value chains. These production activities have become increasingly fractionalised at the same time as these stages in the production chain have become more geographically dispersed.

Unlike international exchanges during the first wave of globalisation, which meant increased trade in goods (and increased migration), the latter half of the second wave is characterised by much more complex international exchanges. Trade in goods, in particular input goods and components, has continued to increase but trade in services has also grown and international direct investment has increased considerably. The latter manifests itself in Figure 2.2, which describes trends in GDP, export and foreign direct investment in the world between 1970 and 2010, where we see that from the mid-1990s direct investments have grown faster than both GDP and exports.

Figure 2.2 Trends in GDP, export and foreign direct investment in the world, 1970-2010.



Remarks: GDP, export and foreign direct investment are in USD 2000 prices, index 1970 = 100, and transformed to a logarithmic scale.

Source: UNCTAD and The World Bank, World Development Indicators.

The latter part of the second wave of globalisation is also characterised by an increase in international transfers of knowledge. This applies to both formal intellectual property rights, for example patents and licences, and more tacit knowledge, such as organisation and marketing. The use of services required to coordinate increasingly dispersed production, such as telecommunications, internet, express deliveries of parcels, air freight, trade related financial services, has also increased.

Recent phenomena that are strongly linked to the increasing importance of the global value chains are outsourcing and offshoring. For many companies, a large (and increasing) proportion of their value-creating activities nowadays take place outside the company itself and/or outside the country where it is primarily located. The company has to make two key decisions. The first is whether to carry out a task itself or buy it from another company and the second whether the activity should be carried out at home or overseas. Figure 2.3 illustrates the alternatives facing the company.

Figure 2.3 Outsourcing or offshoring.

| | | Geographical location | |
|--------------|------------------------|-------------------------------|------------------------------|
| | | Home | Abroad |
| Do or buy | Within the company | (i) In-house | (ii) In-house offshoring |
| | Outside the company | (iii) Domestic outsourcing | (iv) Offshore outsourcing |

The company can choose between: (i) carrying out the activity locally within the company (in-house), (ii) keeping the activity inside the company but providing it from abroad (offshore), (iii) outsourcing the task to another company domestically or (iv) to another company abroad. Outsourcing means that the activity is contracted out to an external company while offshoring means that it takes place in a country other than the one where the company's operations are primarily located.

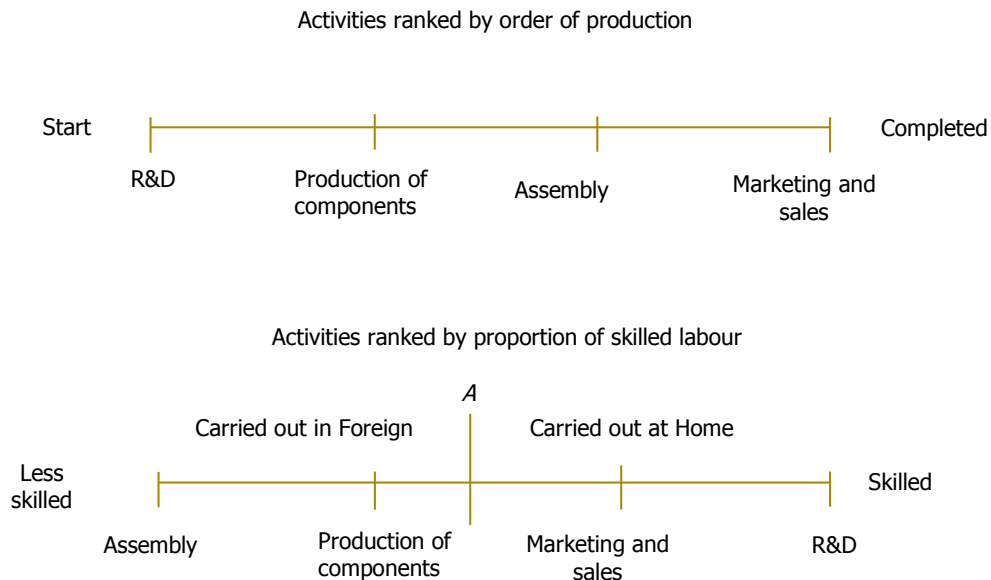
To analyse what impact the emergence of global value chains and offshoring have had on production and employment in the Swedish business sector in recent years we take our starting point in the analytical framework presented in the next section.

3 A simple model framework for global value chains and offshoring

3.1 Offshoring and relative demand for skilled labour

As the starting point for our empirical analysis we use a simplified version of Robert Feenstra's and Gordon Hanson's (1996, 1997) model.¹ The production of a product includes a number of activities. In the upper half of Figure 3.1 we have listed these activities and the order in which they take place. In the lower half, we have listed the same activities but now ordered in terms of the proportion of skilled labour used in the activity, where the proportion is highest in R&D (furthest to the right) and least in the assembly of the product.

Figure 3.1 The product's value chain.



Assume that there are two countries, Home and Foreign, and that wages in Foreign are lower than in Home, i.e. $w_L^* < w_L$ and $w_S^* < w_S$, where w_L^* and w_S^* are wages for less skilled and skilled labour in Foreign. Also assume that the relative wage for less skilled labour is lower in Foreign than in Home, $w_L^*/w_S^* < w_L/w_S$. The latter is a realistic assumption if Home is a more developed country than Foreign.

When a company in Home considers relocating operations to Foreign it knows that it will reduce its labour costs since wages are lower in Foreign. On the other hand, the company needs to take into account the extra costs that arise for establishing itself there. These may be higher capital costs or additional costs for transportation and communication and customs duties that Foreign levies on input goods (components) if they are imported to Foreign. Let us consider the two last costs.

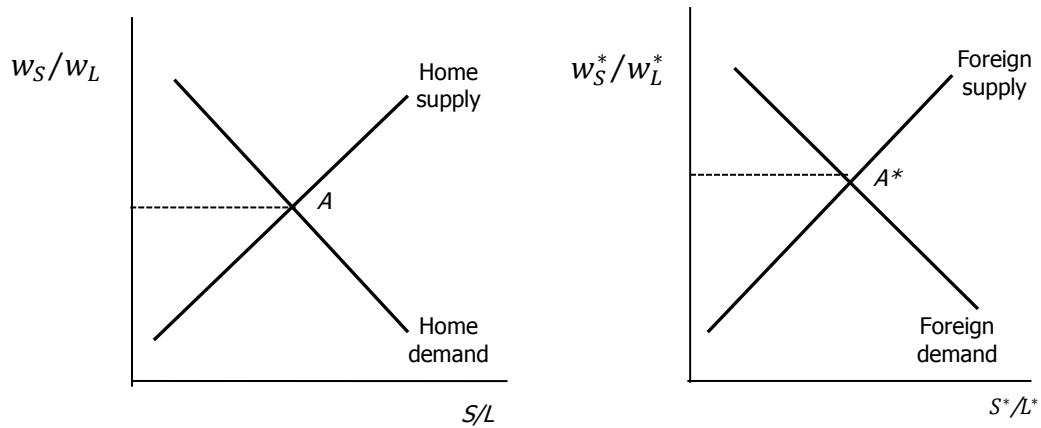
¹ The illustration is based on Feenstra and Taylor (2008) pp. 232-238. A more formal description of the model can be found in Feenstra (2004) pp. 111-117.

Higher capital and trade costs in Foreign mean that the company will not relocate all its activities there. The companies in Home will weigh the gains from lower wages against the extra costs for capital and trade.

Let us for the sake of simplicity assume that these additional costs add 10% to every activity in the value chain that is relocated to Foreign. This means that companies in Home will relocate those activities that use the greatest proportion of less skilled labour to Foreign and keep those where the share of skilled labour is high. In Figure 3.1 this means that all activities to the left of vertical line *A* will be carried out in Foreign while those to the right of vertical line *A* will continue to be carried out at Home. This is because the cost savings resulting from paying lower wages in Foreign are greatest in those activities that demand a high input of less skilled labour.

With this knowledge of the division of activities between Home and Foreign we can illustrate the demand for labour in both countries. For Home, we add together the demand for skilled labour *S* and for less skilled labour *L* for all activities to the right of line *A* in Figure 3.1. In Figure 3.2 we have plotted the ratio *S/L* against the relative wage w_S/w_L . The relative demand for skilled labour curve slopes downwards since a higher relative wage for skilled labour means that Home replaces skilled labour with less skilled labour in certain activities. To the right in the figure we have also entered the relative demand for skilled labour in Foreign, built up in the corresponding way.

Figure 3.2 Relative demand and relative supply of skilled/less skilled labour.



We have also added a line for the relative supply in each country. These slope upwards since a higher relative wage means that more skilled individuals find their way to the industry, for example by more people equipping themselves with the knowledge necessary to earn the higher relative wage. *A* and *A** show the relative wage and relative employment of skilled in relation to less skilled labour in equilibrium.

Assume now that capital costs or trade costs have decreased in Foreign. The companies in Home will now find it profitable to move more activities to Foreign. Increased offshoring to Foreign means that the dividing line between production in Home and in Foreign in Figure 3.3 is shifted from *A* to *B*. Note that these activities have a higher proportion of

skilled labour than those previously carried out in Foreign (to the left of *A*) but a smaller share of skilled labour than the activities now carried out in Home (to the right of *B*).

Figure 3.3 Effects of offshoring in the value chain.

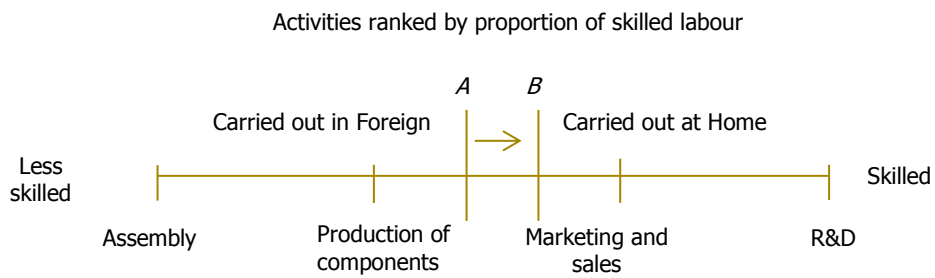
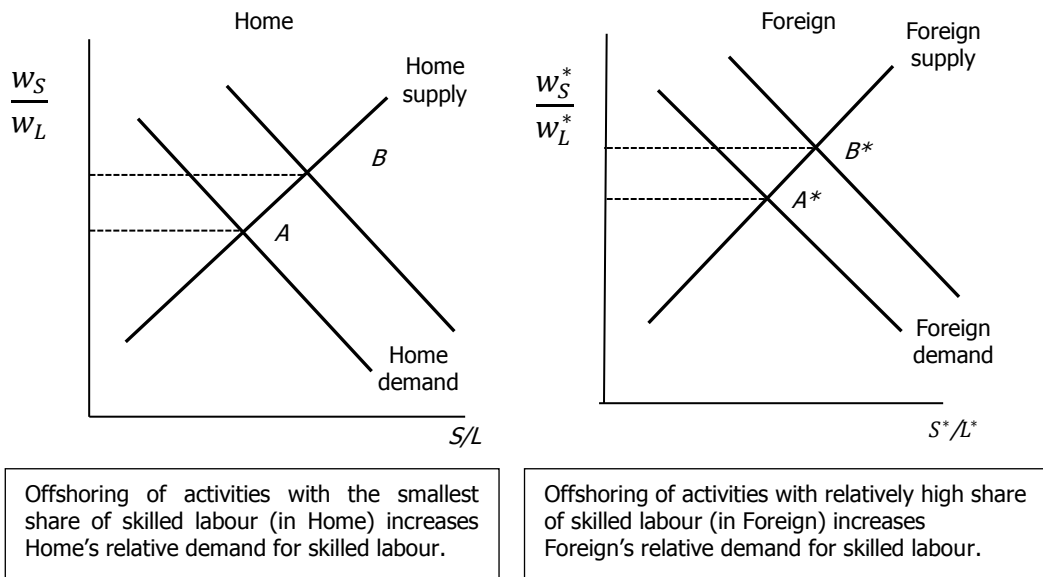


Figure 3.4 Changes in relative demand for skilled/less skilled labour.



Here, there is an impact on the relative demand for skilled labour in Home. Since the activities that are now carried out in Home on average have a higher proportion of skilled labour than those previously carried out in Home, the relative demand for skilled labour increases; in Figure 3.4 Home's relative demand curve is shifted to the right. The equilibrium shifts from *A* to *B* and the relative wage for skilled labour w_S/w_L increases at the same time as relative employment S/L increases.

What happens in Foreign when Home relocates more activities there? How are relative demand and the relative wage affected in Foreign? The activities relocated to Foreign (those between *A* and *B* in Figure 3.3) have a higher proportion of skilled labour than those originally relocated (those to the left of *A* in Figure 3.3). This means that those activities that are now carried out in Foreign on average have a higher share of skilled labour than

those previously carried out there. For this reason, the relative demand for skilled labour also increases in Foreign; in Figure 3.4 Foreign's relative demand curve is shifted to the right. This means that the equilibrium shifts from A^* to B^* and as a result of increased offshoring from Home to Foreign the relative wage for skilled labour also increases in Foreign.

In other words, both countries experience an increase in the relative wage for skilled labour as a result of increased relative demand for skilled labour from offshoring of activities from Home to Foreign. The explanation for this lies in the fact that when activities in the middle of the value chain (ranked by proportion of skilled labour used in production) shifts from Home to Foreign the relative demand for skilled labour increases in both countries. This is because these activities are those that have the *lowest* share of skilled labour in Home but have the *highest* proportion of skilled labour in Foreign.

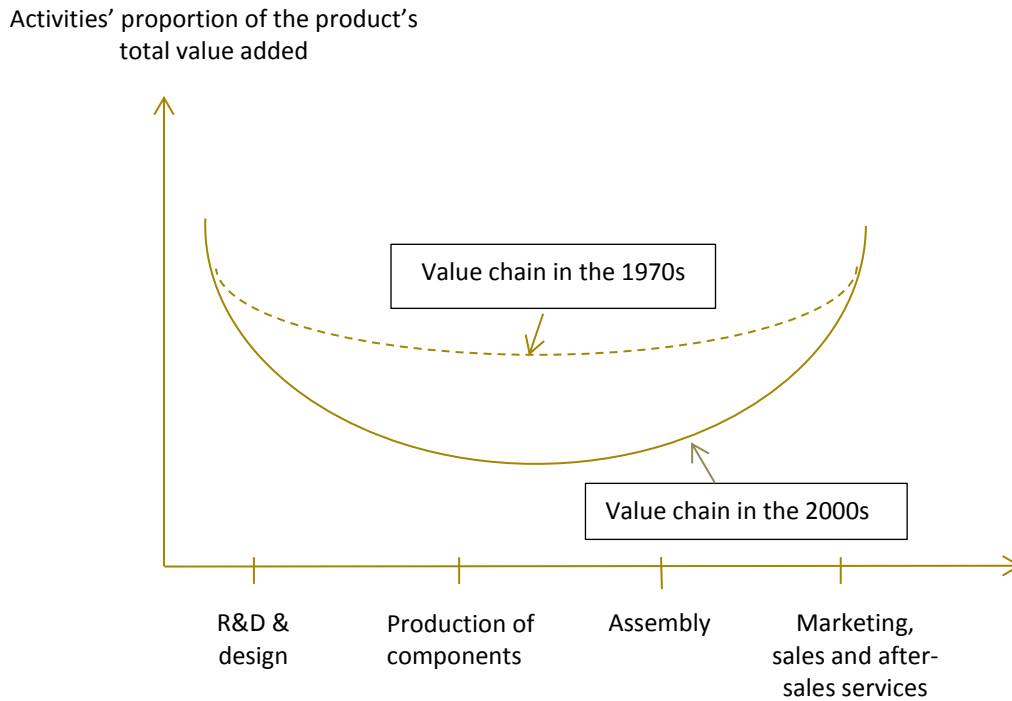
3.2 The smile curve

Another way of viewing value chains is to try to determine how large a proportion of the value added each activity represents. Since the value added consists of payments to production factors, e.g. labour, and pure profits (mark-ups) it is reasonable to assume that the proportion is greatest in the most human capital intensive parts of the value chain or where the companies have a natural market power, among other things as a result of product differentiation, brand, etc. Figure 3.5 illustrates the proportions of the total value added in different parts of the value chain described in Figure 3.1 and how they have developed since the 1970s.²

We normally assume that the curve, from having been largely horizontal during the 1970s – at that time almost all activities in the value chain were carried out in the developed countries – has tended to become more U-shaped (looks happier). The manufacturing parts in particular account for a considerably lower proportion today than in the 1970s. One explanation is that when activities in the value chain, with relatively little use of skilled labour, are shifted out to low-wage countries the costs are reduced, which automatically means that these activities' proportion of the total value added decreases. This development is also reinforced by companies with offshoring activities also tending to allow their advanced technology to move to those countries. This pushes down the cost of these activities still further, reducing their proportion of the value added even more.

² *The basic idea behind the smile curve comes from Acer's founder Stan Shih. He used it to illustrate the problems that Taiwanese IT manufacturers would encounter if they continued to only rely on their competitive advantages in manufacturing.*

Figure 3.5 The smile curve.



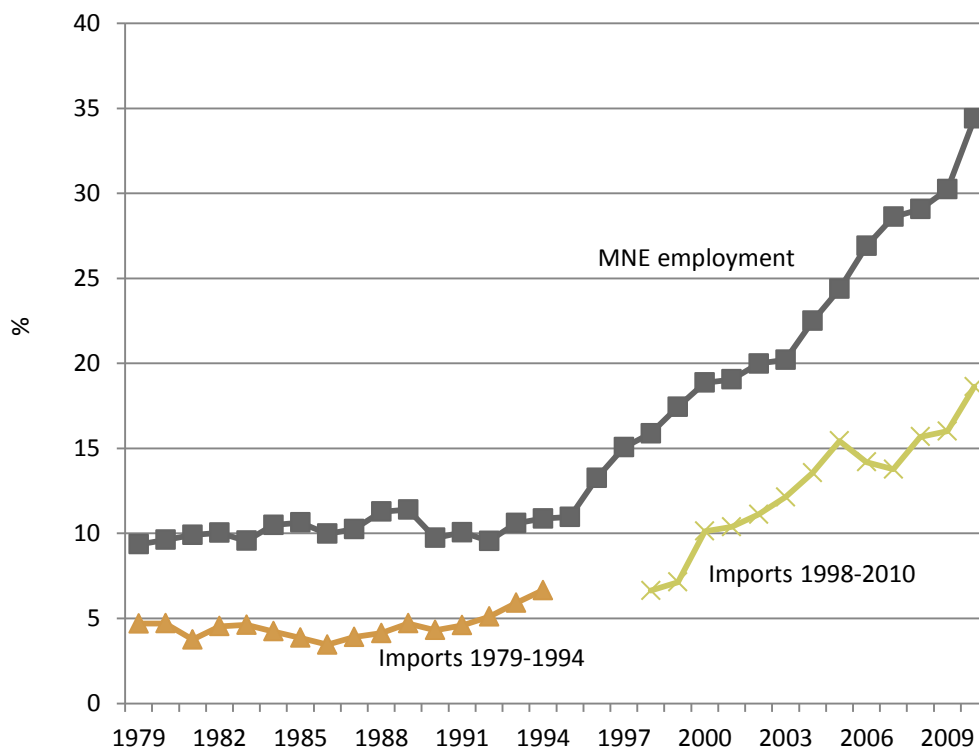
It is worth noting that the share of services is considerable in those parts of the value chain that account for a high proportion of the value added, i.e. in the non-manufacturing parts of the value chain at the beginning and end of the value chain. From the point of view of policy, the developed countries have shown an increasing interest in ensuring that these very parts continue to remain where they are.

4 Offshoring and development of the Swedish labour market

4.1 Increasing demand or excess supply of skilled labour?

Let us now use the model in Section 3.1 to interpret the development of the Swedish labour market in recent years. As regards Swedish multinationals it can be seen from Figure 4.1. that they have increased the number of people employed in low-wage countries since the mid-1990s. The proportion employed in low-wage countries is relatively steady at around 10% until 1995, after which it rapidly increases to reach almost 35% in 2010. This development is in line with Swedish multinationals relocating activities that demand a large input of less skilled labour to countries where access to less skilled labour is relatively good. This is an issue to which we shall return later in the report.

Figure 4.1 Proportion of people employed in subsidiaries of Swedish multinational industrial enterprises in low-wage countries and imports of goods from low-wage countries as a share of consumption in Sweden, 1979-2010.

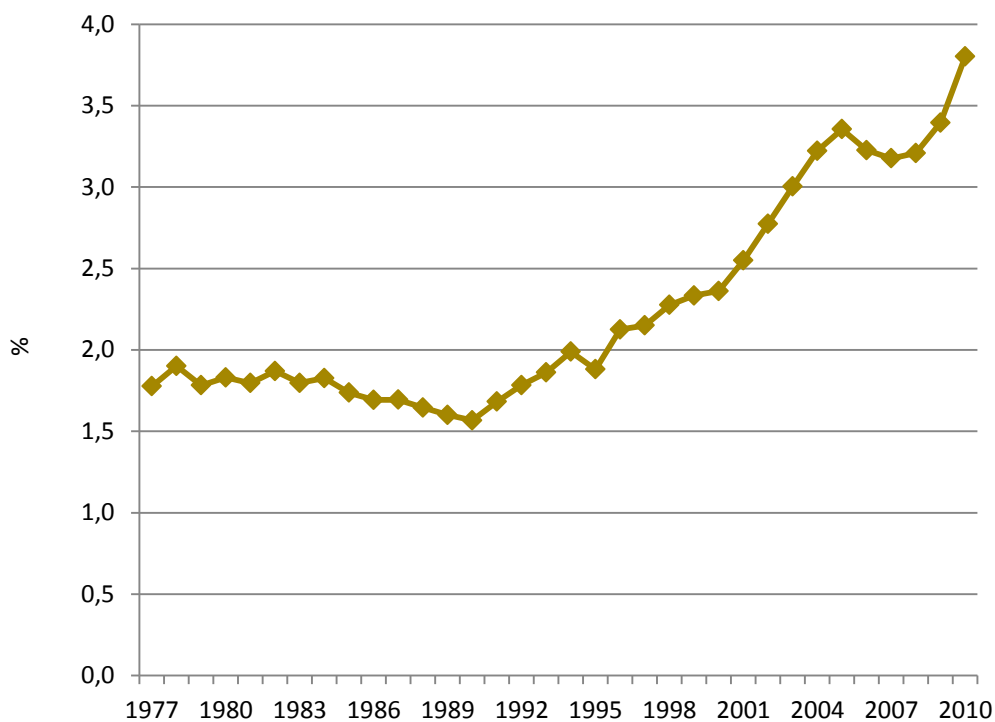


Source: Statistics Sweden, Foreign trade statistics and Growth Analysis, Swedish enterprise groups with overseas subsidiaries.

We can also see from Figure 4.1 that imports from these countries have risen substantially since the beginning of the 1990s. During the whole of the 1980s imports from low-wage

countries represented approximately only 5% of total consumption. At the beginning of the 1990s this proportion tends to increase and between 1998 and 2010 it more than doubles, from 8% to 19%. Both as regards development in the Sweden multinationals and imports from low-wage countries, this may have contributed to reduce demand for less skilled labour in Sweden, i.e. has shifted the relative demand curve for skilled/less skilled labour in Sweden outwards.³

Figure 4.2 Number of university degrees among people aged 20-29 as a proportion of population group 20-29, 1977-2010.



Source: Swedish National Agency for Higher Education and Statistics Sweden, Population statistics.

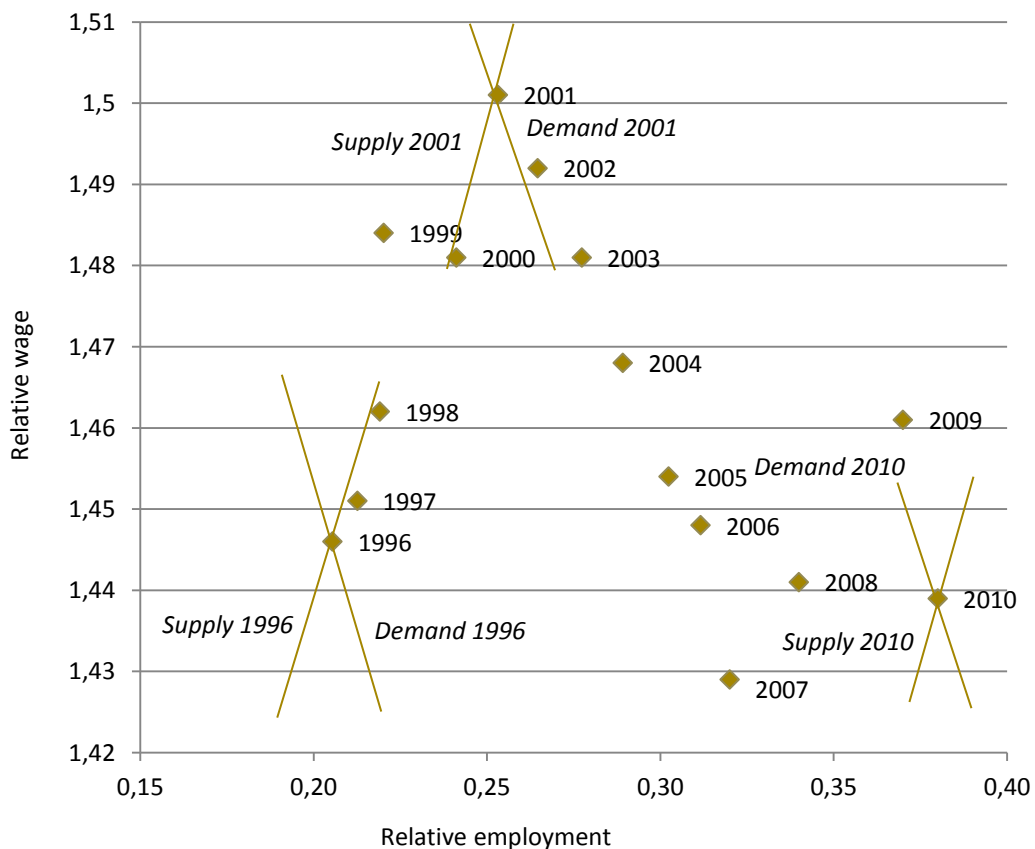
On the other hand, substantial changes have also taken place on the supply side as regards availability of skilled labour. Figure 4.2 shows the number of graduate degrees among people aged 20-29 as a proportion of population group 20-29 between 1977 and 2007.

³ Another factor that may have increased relative demand for skilled labour is technological change. It has been claimed that technological change has been “skilled-biased”, which means that for a given relative wage between skilled and less skilled labour this leads to the relative demand for skilled labour increasing. One important reason for this is supposedly the increased use of computers that led to faster development of productivity among skilled labour than among less skilled labour. Computers also often replace less skilled labour while they complement skilled labour.

From having remained at 1.5-2% until the mid-1990s it then climbs rapidly, not least in the early 2000s, reaching almost 4% in 2010. In other words, the relative supply curve for skilled/less skilled labour also seems to have shifted outwards in Sweden.

To give an idea of the impact of factors on the demand and supply sides of the Swedish labour market from the mid-1990s to 2010 we now add the relative wage between skilled and less skilled labour w_S/w_L and relative employment S/L . As a measure of the relative wage we use the university wage premium obtained from the estimate in a wage equation where individuals with at least three years of university education are compared with those who have three years of upper secondary education. Relative employment between skilled and less skilled labour is made up of the number of people employed with post-secondary education in relation to the number of people employed without post-secondary education.

Figure 4.3 Relative demand and relative supply of skilled/less skilled labour in Sweden, 1995-2010.



Remarks: The relative wage on the y-axis is obtained from the regression estimates in a model (Mincer equation) where monthly wage is the dependent variable and is explained by education (dummy variables for education groups: compulsory school, two-year upper secondary school, post-secondary school < 3 years, post-secondary school >= 3 years and post-graduate studies), experience (age – length of education), experience squared, and gender. The model has been estimated using data from structural wage statistics where the observations have been weighted with their upward-adjustment factors. In 1996, the average wage in Swedish industry for an individual with three years of university education was slightly less than 45% higher than for an individual with three years of upper secondary education. Relative employment on the x-axis is the number of people employed with post-secondary education in relation to the number of people employed without post-secondary education.

Source: Statistics Sweden, Structural wage statistics and register-based labour market statistics (RAMS).

It can be seen from Figure 4.3 that in 1996 the industrial wage for people with three years' university education in relation to the wage for people with three years of upper secondary education was on average slightly less than 45% higher. The difference increased until 2001, when the more skilled labour's wage was about 50% higher before beginning to fall and decreasing to about 44% in 2010. The relative employment between skilled and less skilled labour increases over the entire period studied.

One interpretation in line with the pattern that can be seen in figure 4.3 is that the factors on the demand side are relatively strong during the late 1990s (marked outward shift of the relative demand curve), which means that the relative wage is pushed upwards at the same time as relative employment increases (the relative supply curve is also shifted outwards, although to a smaller degree). During the latter parts of the period, and in particular during the first years of the 21st century, it would seem that the substantial increase in supply of more skilled labour (see Figure 4.3) means that the outward shift is greater for the relative supply than for the relative demand.

One way to try to quantify the impact of offshoring on the relative demand for skilled labour, and also get an idea of what types of activity Sweden has comparative advantages in, is to study Swedish multinationals and the effects on the composition of the workforce in their parent companies in Sweden of expansion in their overseas subsidiaries.

4.2 Decomposition of global value chains within Swedish multinationals

The companies that have driven the international fragmentation of the production process furthest are probably the multinationals. If we wish to study the importance of the global value chains they are therefore of particular interest. Multinationals (Swedish- and foreign-owned) hold a prominent position in the Swedish business sector and foreign trade. This applies not least in the manufacturing industry where 60% of those in employment work in multinationals but also in the service sector the proportion employed in multinationals is considerable (32% in 2009). Moreover, in an international perspective very good data is available concerning multinationals in Sweden.

One important driving force for multinationals to expand abroad might be the very mechanism described above in the simple offshoring model, i.e. to exploit the improvement in basic conditions that falling transport, communication and information costs lead to as regards carrying out activities with varying factor intensity in countries with different relative availability of skilled labour. With global value chains it is thus possible to take advantage of factor price differences between different countries by for example locating skilled labour intensive operations in countries with a relatively good supply of skilled labour and locating activities that demand a relatively large input of less skilled labour in countries with a relatively plentiful supply of less skilled labour. In the literature on direct investment, these investments are normally considered to be factor seeking (vertical).

Another driving force that is usually put forward in the theoretical literature is market-seeking (horizontal) motives. Unlike vertical multinationals, horizontal multinationals produce, roughly speaking, the same product or service in different places. Horizontal multinationals arise if there are advantages of scale at plant level in combination with costs for international trade. Given the trade costs, the greater the advantages of scale the greater the probability of exporting. The converse applies, given the advantages of scale the higher the trade costs the greater the probability of establishing production abroad (foreign direct

investment). Advantages of scale at plant level also mean that the market in the host country must be of a certain size for direct investments to be made. If the market is too small, it will be more profitable to satisfy the market's needs through exports than establishing production locally. Horizontal direct investments thus occur through balancing concentrating production to one place against increasing proximity to the market through local production (proximity-concentration trade-off).⁴

What empirical implications might this have for Sweden, a country with relatively good access to skilled labour? Regarding direct investments, these would probably have a significant positive impact on the proportion of skilled labour in the parent companies in Sweden when activities that primarily use skilled labour are relocated to other countries with a poorer supply of skilled labour. A transfer of production from parent company to subsidiary in a horizontal multinational is on the other hand not expected to have any direct impact on relative factor demand in the home country; horizontal direct investments are assumed not to affect the share of skilled labour in the parent companies in Sweden.⁵

Several researchers, for example Blinder (2006), have claimed in recent years that it is rather the nature of the tasks that are carried out in a job than the level of education required to carry it out that determines the likelihood of it being relocated overseas (offshorability). There are primarily two characteristics of an occupation that affect its likelihood of being relocated abroad. First, the proportion of routine tasks must be considerable; that they can be codified in simple instructions that are easy to learn without being misunderstood. Second, that the occupation largely produces non-personal services that demand little face-to-face contact with the end user. These characteristics might in themselves be strongly correlated to the level of education that an occupation requires but there is nothing a priori that indicates that this is the case.

By using data on Swedish multinationals and the numbers of people employed in their overseas subsidiaries and the parent companies in Sweden between 2001 and 2008 we have been able to investigate whether the increase in offshoring affects the workforce's educational and professional composition in Sweden. Such an analysis might also give us an indication of in what types of activities Sweden has comparative advantages since international trade within the framework of global value chains rather gives rise to international specialisation in terms of operations/activities than in terms of industries. We apply an approach that has been used in recent years to study changes in relative labour demand where employees have different skill levels (level of education) or carry out different tasks.

The starting point for our analysis is a regression model that describes the relationship between offshoring in terms of changed employment in Swedish multinationals' overseas subsidiaries and changed relative labour demand at the parent company in Sweden.⁶ As a measure of relative labour demand we use the wage bill share of skilled labour at the parent companies. Skilled labour is defined as employees with some form of post-

⁴ *The model has its origins in Markusen (1984) and an interesting empirical application on American data can be found in Brainard (1997).*

⁵ *There may be certain positive effects on the proportion of skilled labour in the home country through activities at the head office in the home country, which normally has a higher proportion of well-educated people than the average for the group, also increasing when a multinational expands overseas.*

⁶ *A thorough review of the results and the method we used can be found in Eliasson et al. (2011a) pp. 26-29.*

secondary education. An alternative measure is the wage bill share of people carrying out non-routine tasks. In the analysis we investigate both the impact of offshoring generally and offshoring to high- and low-wage countries respectively. We also analyse the outcome for the entire private business sector and for manufacturing and the service sector separately.

In summary we note that there is a fairly robust connection between offshoring and relative labour demand. An increase in the number of people employed in Swedish multinationals abroad seems to coincide with increased wage bill share of labour carrying out non-routine tasks or of skilled labour at the parent companies in Sweden. This finding applies generally and for companies in both manufacturing and the service sector. When we proceed further and investigate any differences between offshoring to low- and high-income countries the results are less clear-cut. For manufacturing companies, the impact on the relative labour demand is especially great when offshoring to low-income countries, which we interpret as an indication that it is primarily a matter of vertical direct investments where less skilled production is moved out of the country. For service companies, the difference in impact on relative labour demand is in general somewhat lower depending on whether the offshoring is to low- or high-income countries. In this context there is reason to underline the fact that the service sector consists of a fairly heterogeneous group of companies. Both the motives for and the effects of direct investments can therefore be expected to vary depending on what type of service is being produced. A more disaggregated analysis by industry might thus result in other, possibly more distinct, conclusions. In addition to the impact of offshoring on relative labour demand we also find that the Swedish parent companies over time demand more skilled labour to an increasing extent. The trend towards increased skill intensity in production is somewhat more pronounced among the industrial companies compared to the service companies.

From these findings we draw the conclusion that within the framework of the global value chains, the more skilled parts of the Swedish multinationals and where more non-routine tasks are performed, seem to have remained in Sweden and possibly been developed. Less skilled activities on the other hand, where more routine activities are carried out, seem to a considerable degree to have disappeared abroad.⁷

⁷ *We wish, however, to emphasise that our findings are based on preliminary estimates and that we hope to be able to develop the analysis at a later date.*

5 The Swedish R&D paradox – an illusion?

The model in Section 3.1, that describes how a company can divide up the value chain into several parts and by means of offshoring locate parts of the chain in other countries, might very well be able to be used to explain the so-called “Swedish R&D paradox” that has been the subject of much debate for many years.⁸ The “paradox” lies in the fact that Sweden has for a long time been a leader as regards R&D intensity, that is to say that the cost of industrial R&D as a proportion of industry’s value added has been high, at the same time as the proportion in respect of high-tech production – delimited on the basis of the industry’s R&D intensity⁹ – in Sweden’s total industrial production has been mediocre or low. But this relationship – which does not need to be particularly paradoxical – might quite simply be able to be explained by the fact that Swedish multinationals have tended to locate their R&D activities in Sweden but manufacture their products in other countries.¹⁰ In other words, Sweden seems to have a comparative advantage in R&D but not in manufacturing. The comparative advantage in R&D might in its turn be explained by access to a research setting of high class and competent researchers at relatively low cost.

Figure 5.1 illustrates the Swedish R&D paradox. Most countries with high R&D intensity have much of their industrial production in high-tech sectors, the exceptions being Sweden, Ireland, Hungary and the Czech Republic.¹¹ The obvious explanation is that Ireland, Hungary and the Czech Republic – countries where by comparison with other OECD countries companies are to a large degree foreign-owned¹² – form a base for multinationals’ production of high-tech products while research is carried on in some other country. Sweden on the one hand and Ireland, Hungary and the Czech Republic on the other thus seem to be each other’s opposite poles in this respect.

⁸ *The idea of a paradox was introduced as long ago as 1991 by Charles Edquist and Maureen McKelvey in an appendix to the final study of the Productivity Delegation (Edquist and McKelvey 1991). That the patterns illustrated in figure 5.1 might constitute a paradox has been questioned before with similar arguments to those for example in Hansson and Lundberg (1995) pp. 100-105, Hansson (1997) pp. 134-135 and Lundberg (1999) pp. 84-89.*

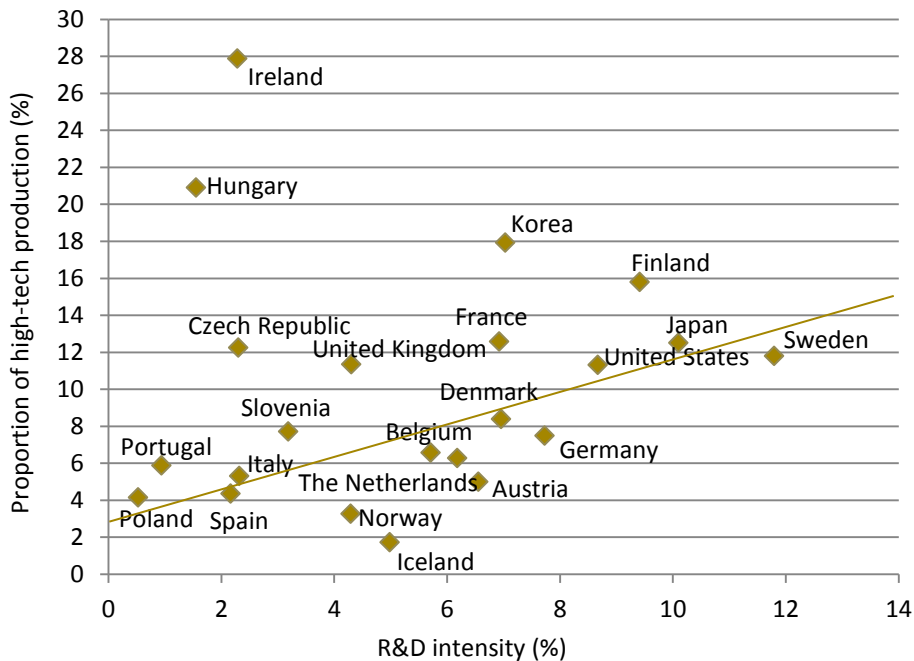
⁹ *High-tech industries as defined by the OECD are: Drugs and medicines (244), Office and computing equipment (30), Communications equipment (32), and Aerospace (353).*

¹⁰ *Regarding expenditure in respect of R&D conducted in Sweden, Swedish multinationals are the leaders by a long way. In 2009, they accounted for slightly less than 57%, foreign-owned companies for 30% and other Swedish companies for the remainder (Growth Analysis 2011).*

¹¹ *These countries have been excluded in the calculation of the regression line in figure 5.1, $HT = 2,85 + 0,983 \times RDVA$, where HT is the proportion of high-tech production and RDVA represents R&D expenditure as a proportion of value added within the industry: the t-ratio for the coefficient of slope is 3.18.*

¹² *The proportion of people employed in foreign-owned companies in 2007 was 46% in Ireland, 45.5% in the Czech Republic and 36.9% in Hungary. The proportion is higher than in Sweden, as is 33.4%, which is well above the OECD average (OECD Statistics on Measuring Globalisation).*

Figure 5.1 R&D intensity in industry and proportion of high-tech production.



Remarks: R&D intensity is the expenditure on research and development as a proportion of the value added and is an average for 2003 and 2005 (except for France and the UK, only 2005). Share of high-tech production is from 2007 (except for Korea, Portugal and Slovenia 2006).

Source: OECD, Science, technology and R&D statistics and National accounts statistics.

The R&D paradox might thus very well be able to be explained within the framework of an argument concerning global value chains and the question is whether it is actually a problem.¹³ We might also wonder why, if the outcome of R&D in Sweden is so poor, the major companies continue to invest large sums of money in R&D in Sweden year after year.

Two lessons can be drawn from this discussion of the R&D paradox. One is that it is important to make a well-founded analysis of the problem before recommending any

¹³ A study of the Swedish R&D paradox was recently published by Ejeremo, Kander and Svensson Henning (2011). They analyse how R&D expenditure and value added have developed in fast- and slow-growing sectors in the Swedish private business sector. They find that R&D expenditure has risen considerably faster than value added in the fast-growing sectors, while the same development cannot be seen in the slow-growing sectors. They interpret this as an indication that there is a paradox in the fast-growing sectors but not in the slow-growing sectors. A similar objection to the one put forward above can, however, also be made against this analysis since it does not take into account possible positive effects of R&D in Sweden on production abroad. The authors are no doubt well aware of this but it is a significant problem against the background of the importance of the multinationals to the Swedish business sector, and not least that it is these very companies that account for by far the largest portion of R&D expenditure in Sweden.

policy measures.¹⁴ It is probably not possible solely on the basis of the “paradox” to claim that the Swedish innovation system is ineffective (large input but small output) and that there are therefore considerable unexploited opportunities to pursue an innovation policy. The other is that the global value chains’ increased importance has meant that it has become increasingly difficult to identify international competitiveness using measures based solely only on production values.¹⁵ This applies especially in the case of the manufacturing industry where input from other sectors of the economy is considerable and also that the import portion of the input is substantial and growing.¹⁶ In Appendix 1 we visualise these problems with an example of how measures of this kind can lead to misinterpretations when we try to determine in what kind of activities a nowadays so important player in the world markets as China has its comparative advantages.

¹⁴ Based on the “paradox”, Edquist (2010) provides a whole catalogue of measures in the innovation policy area.

¹⁵ One of the most common is Balassa’s revealed comparative advantage (RCA). For Sweden’s international competitiveness in a product group j it is defined as the ratio of Sweden’s portion of world exports in product group j and Sweden’s portion of the world’s total exports, i.e. $(X_{iSv}/X_{iOECD})/(X_{Sv}/X_{OECD})$. If RCA is greater than 1, this indicates that Sweden has comparative advantages in production in the product group.

¹⁶ Eliasson et al. (2010), tables 2.1 and 2.2.

6 Structural changes and international competitiveness in the service sector

The increase in international trade within the framework of global value chains has meant that international exchange takes place nowadays on a more disaggregated level. It has also been claimed that it would mean that trade in services becomes more important.¹⁷ It is also clear that the service sector's exports as a proportion of Sweden's total exports have grown in recent years and also that input to the production of goods from the service sector is considerable.¹⁸ There may therefore be reason to focus more closely on the service sector, which parts are exposed to international trade and their international competitiveness.

6.1 Tradable services: characteristics, development and international competitiveness

In order to overcome the problem of statistics on international trade in services still being relatively under-developed¹⁹, we use another way of elucidating the internationalisation of the service sector. We begin by trying to identify which industries (occupations) are (or might potentially be) exposed to international trade.²⁰ With this division as our starting point, we create three sectors in the Swedish economy: non-tradable services, tradable services and manufacturing, the last being fully exposed to international trade. In order to give an idea of which industries are most prominent in tradable services, in Table 6.1 we show the 10 industries that had most employees in 2010 (to the left) and the 10 that have had the greatest increase in employees between 1990 and 2010 (to the right). One outstanding feature of the table is that many of the dominating industries in tradable services are business, professional and technical service activities of various kinds.

¹⁷ *Globerman (2012).*

¹⁸ *Eliasson et al. (2011b) figures 2 and 3.*

¹⁹ *In Eliasson et al. (2010), Appendix 1, we discuss how the statistics on international trade in services in Sweden might be extended and improved.*

²⁰ *The approach, developed by Jensen and Kletzer (2006), is based on the regional concentration of an industry (or occupation). If production in an industry (employment in an occupation) is strongly regionally concentrated and consumption is distributed proportionally according to incomes, there should reasonably be regional trade in such an industry (in the tasks carried out in such an occupation). Eliasson et al. (2012) contains a more detailed description of how we have gone about identifying industries (and occupations) in the Swedish economy that are, or might potentially be, exposed to international trade.*

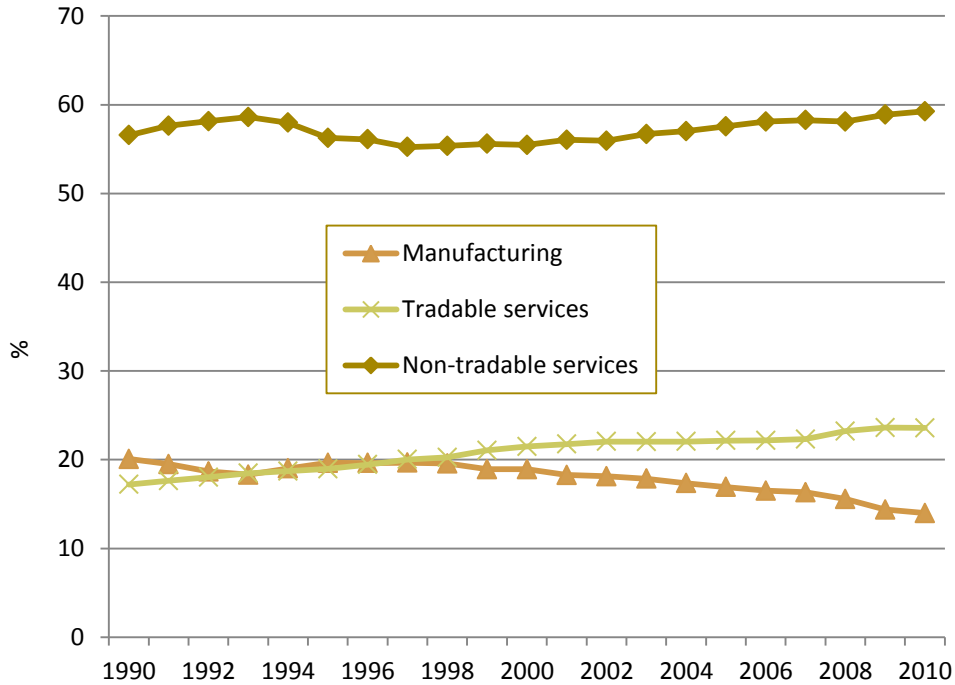
Table 6.1 Number of people employed in 2010 and changes in employment between 1990 and 2010 in industries in tradable services.

| Industry | No. employed 2010 | Industry | Change 2010-1990 |
|---|-------------------|---|------------------|
| Legal and financial consulting firms | 94,665 | System and software consultants | 67,381 |
| System and software consultants | 90,546 | Other company service firms | 45,912 |
| Architect firms, technical consultancy firms | 77,553 | Legal and financial consulting firms | 38,856 |
| Other company service firms | 64,894 | Universities and institutes of higher education | 31,452 |
| Universities and institutes of higher education | 57,694 | Architect firms, technical consultancy firms | 25,999 |
| Wholesale trade in household goods | 56,870 | Wholesale trade in household goods | 14,036 |
| Wholesale trade in machinery and equipment | 53,476 | Advertising and marketing agencies | 9,151 |
| Banks | 44,645 | Retail trade, excl. shops | 9,071 |
| Wholesale trade in food, beverages and tobacco | 29,034 | Other culture creators and entertainment organisers | 9,055 |
| Advertising and marketing agencies | 26,063 | Security companies | 7,466 |

Source: Statistics Sweden, Register-based labour market statistics (RAMS).

Figure 6.1 then shows how employment has developed in the manufacturing industry, and the tradable and non-tradable service sectors between 1990 and 2010. It can be seen that, while the non-tradable service sector has remained almost constant between 1990 and 2010, the tradable service sector, from having had a smaller proportion than the manufacturing industry in 1990, has grown at its expense. This shift in employment within the tradable part of the Swedish economy from manufacturing to tradable services is an indication of the increase in importance of the tradable service sector in recent years.

Figure 6.1 Proportions of people employed in the manufacturing industry and the tradable and non-tradable service sector, 1990-2010.

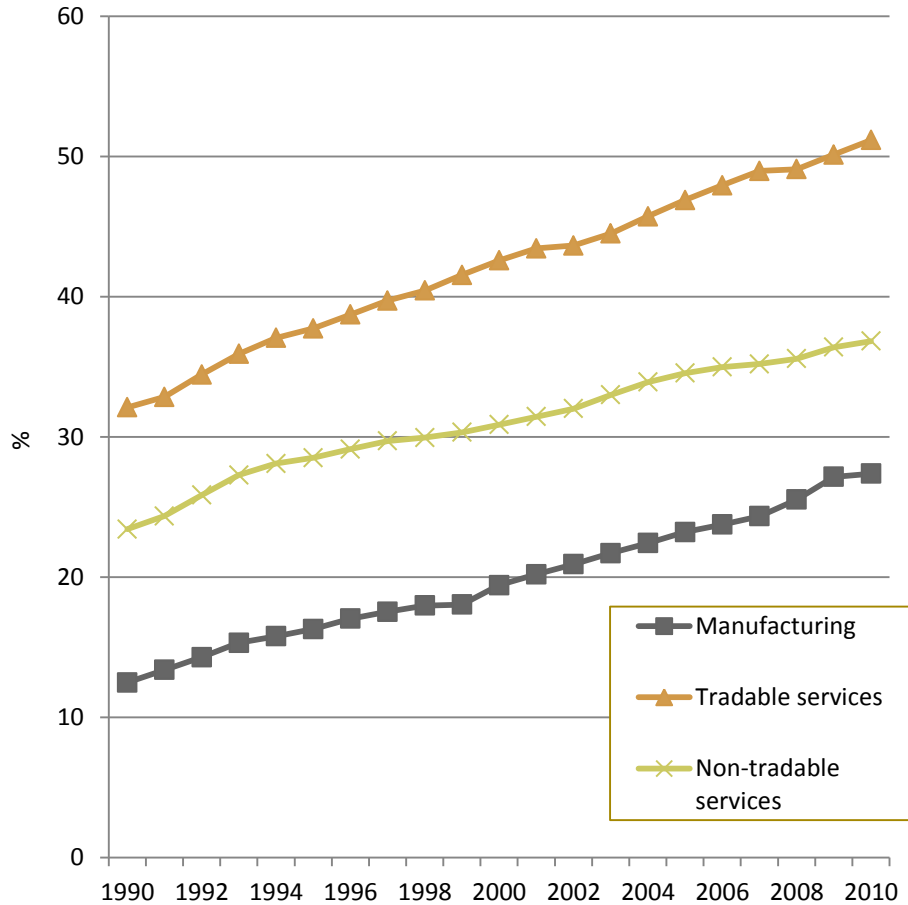


Source: Statistics Sweden, Register-based labour market statistics (RAMS).

One striking feature is that the three studied sectors to a considerable degree differ as regards the share of skilled labour (with post-secondary education) in the sector. Figure 6.2 shows that this is considerably higher in tradable services than in manufacturing and non-tradable services. In 2010, almost half of the people employed in tradable services had some form of university education. The share of skilled labour has also increased fastest in this sector while the slowest rate of increase can be found in non-tradable services. In other words, it would seem that the share of skilled labour has grown faster in the sectors exposed to international trade.²¹ One interpretation of this is that it is first and foremost in this part of the economy that the trend towards less skilled jobs disappearing at the same time as more skilled jobs are created has been particularly strong.

²¹ The share of skilled labour in tradable services has increased by 17 percentage points, in manufacturing by 14 percentage points and in the non-tradable services by 11 percentage points.

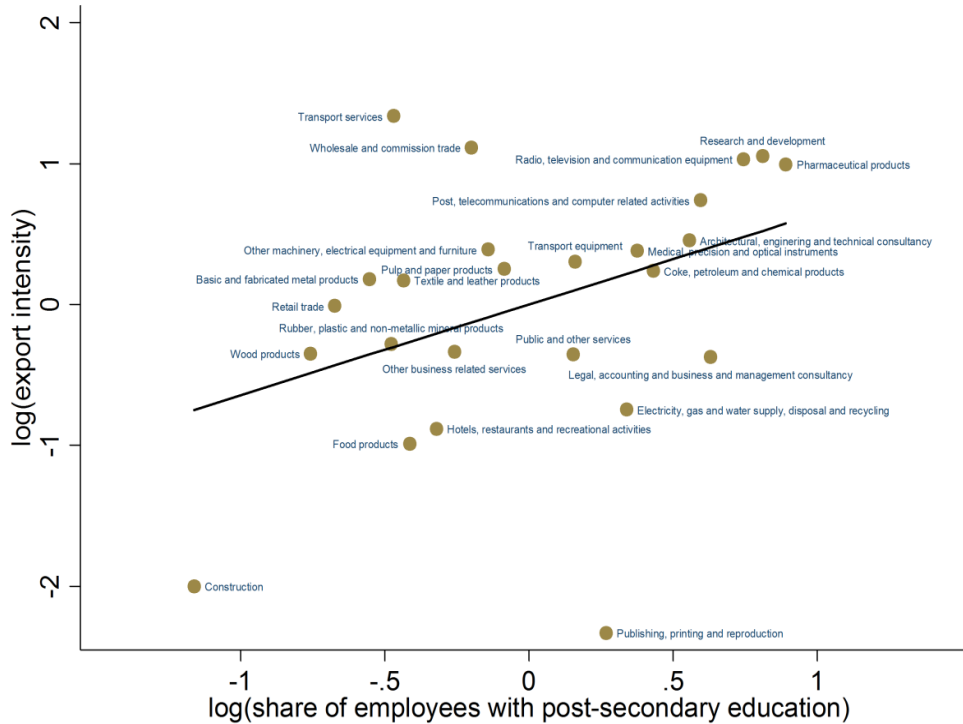
Figure 6.2 Share of skilled labour in manufacturing, tradable, and non-tradable services, 1990-2010.



Source: Statistics Sweden, Register-based labour market statistics (RAMS).

This is remarkable against the background of Sweden seeming, according to Figure 6.3, to be competitive internationally in industries with a high share of skilled labour. Industries with high proportion of employees with post-secondary education tend to have higher total export intensity (exports of goods and services as a proportion of the sales value) and this applies both to the industrial and the service sectors.

Figure 6.3 Partial correlation between share of employees with post-secondary education and export intensity, 2008.



Remarks: Own calculations based on data from Statistics Sweden, *Trade in goods and services*, *The financial accounts of enterprises*, and the LISA longitudinal integration database. Eliasson et al. (2011b) footnote 14 contains a more detailed description of how the regression line was estimated.

The shift in employment that we can see in the part of the economy that is exposed to international trade would thus be able to be explained by the substantial increase in the supply of skilled labour that has taken place since the mid-1990s (Figure 4.2). In order to utilise the increased supply of skilled labour, tradable services, with a high proportion of skilled labour, has expanded at the expense of manufacturing, where the share of skilled labour is considerably lower.²²

6.2 Jobs in tradable services

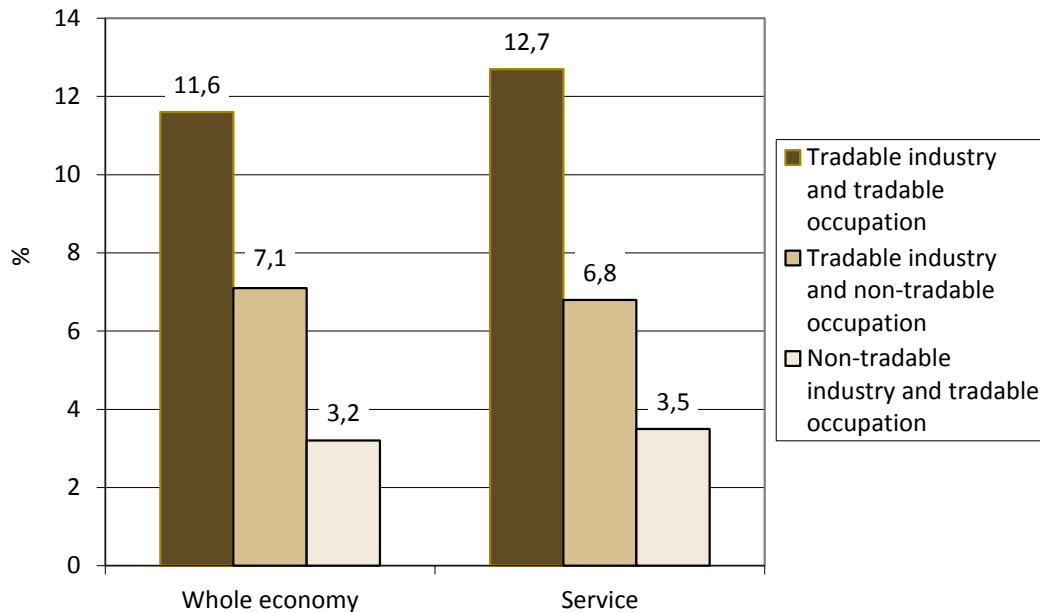
It is worth noting that the people who work in industries and occupations²³ that are tradable appear to have “good jobs” in the sense that their wages are higher than those of people who work in other industries and occupations, but with similar education and other observable characteristics, i.e. there is a wage premium in the job. In Figure 6.4 we can see that people who work in tradable industries and tradable occupations earn almost 9% more

²² In international trade theory this is the Rybczynski effect. A more detailed description of the Rybczynski effect can be found in most text books, for example Feenstra and Taylor (2008) pp. 152-158.

²³ Tradable occupations are in principle identified in the same way as exposed industries (see footnote 20).

than people employed in non-tradable industries and non-tradable occupations. For those who only work in tradable industries, or primarily in only tradable occupations, the wage difference is considerably less.

Figure 6.4 Wage premiums for employees in tradable industries and occupations, 2005.



Remarks: Wage differences in relation to people employed in non-tradable industries and occupations. Wage figures are from Statistics Sweden, Structural wage statistics.

One reason for the wage premium that appears to exist in tradable industries and occupations might be that it is the very exposure to international competition that means that these jobs are less secure and the premium thus constitutes compensation for this insecurity. We have therefore investigated whether: (i) the probability of displacement is greater in these industries, (ii) whether the people who have these jobs have a poorer wage development when they are displaced compared to others who are displaced and (iii) whether they have less probability of finding new employment (being re-employed).

We estimate the probability of being displaced by means of a probit model, where the dependent variable assumes a value of 1 if an individual is displaced. The term displaced is used to refer to an individual who has been separated from a plant between year $t-1$ and year t , i.e. was employed at the plant in year $t-1$, but was not employed at the plant in year t . The plant must also have undergone one of the following two events: large-scale dismissals or closure.²⁴ The displacement refers to year t .

As explanatory variables we use personal characteristics such as age, gender, education and the region where the person lives and the size of the plant and time dummies. All explanatory variables relate to time $t-1$. The model also includes dummy variables for

²⁴ 'Large-scale dismissals' means that the plant has experienced an absolute reduction in employment of five employees or more and a relative reduction in employment of 30% or more between years $t-1$ and t . 'Closure' means that the plant ceased to exist between years $t-1$ and t .

whether an individual was employed in tradable services, non-tradable services or manufacturing at time $t-1$. The model is estimated for a random selection of individuals between 2000 and 2009.²⁵

We estimate the probability of being re-employed in a similar way. In this analysis we use those individuals who in the selection above had been made displaced at some time between 2000 and 2009.²⁶ In the probit model the dependent variable assumes a value of 1 if a person who is displaced finds a new job at time t and the explanatory variables are the same as in the analysis of displacement and thus refer to what was true at $t-1$.

The results of the probit estimates of displacement and re-employment are summarised in Table 6.2, while the full results are shown in Table A2.1 in Appendix 2. Key variables in the analysis of both the probability of being displaced and the probability of being re-employed are whether a person was employed in tradable services, non-tradable services or manufacturing.

Table 6.2 Probability of displacement and re-employment if employed in tradable services or manufacturing compared to non-tradable services, 2000-2009.

| Sector | Displaced | Re-employed |
|--------------------------|-----------|-------------|
| Tradable services sector | + | + |
| Manufacturing | + | - |

Remarks: The sign indicates whether the probability of being displaced (re-employed) is significantly higher compared to those who work in non-tradable services (compared to those who have been displaced from non-tradable services).

The table shows that over the period studied the probability of losing one's job was higher for those working in a sector that is tradable and that the risk was greatest for those who worked in tradable services. If a person on the other hand had been displaced, the chance of being re-employed was greatest if they had previously worked in tradable services. For former employees in manufacturing the prospects of re-employment were not as favourable; the probability of finding new employment was even lower than for people who had previously been employed in non-tradable services. To summarise, the results indicate that the turnover of jobs was particularly high in tradable services and that this naturally applies when other factors that may be of importance as regards the probability of losing one's job and finding new employment are taken into account. The situation seems to be most difficult during the period studied for those who had worked in manufacturing, where the probability of losing one's job was relatively high at the same time as the

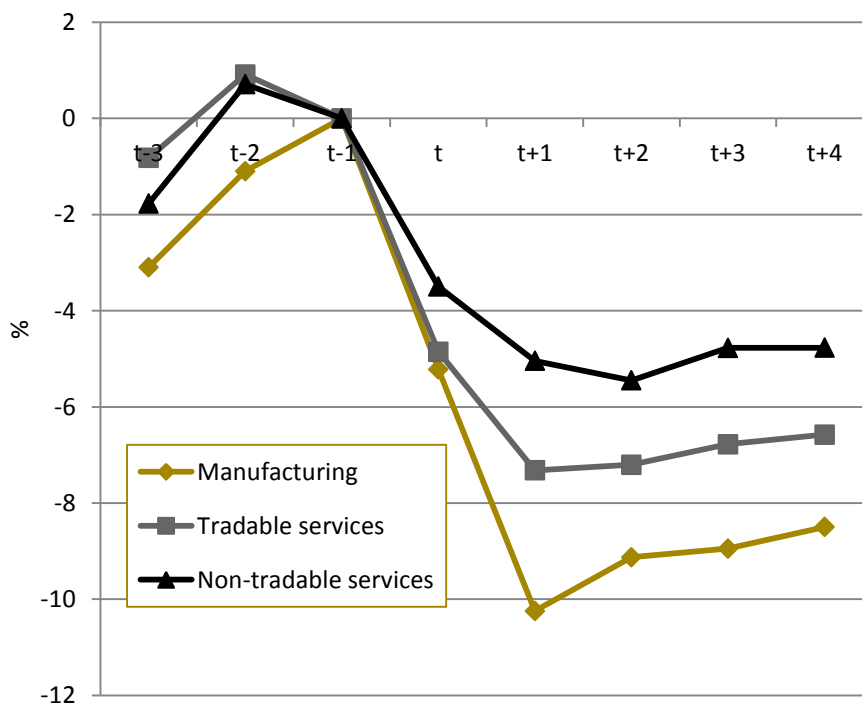
²⁵ Each population cohort in our data contains approximately 1.9-2.2 million individuals that satisfy certain selection restrictions. These mean, among other things, that at time $t-1$ the individuals must be between 20 and 64 years of age; they must be employed, which excludes company owners, self-employed people and people who carry out unpaid work at home; they must have worked for their present employer for a fairly long period (been employed at the same plant in years $t-1$ and $t-2$, and they must be employed at a plant with 10 or more employees. From each cohort we extract a random selection of 10%, which gives us 10 selection cohorts of between 190,000 and 210,000 individuals each. These are then stacked to form a pooled dataset of approximately 2.1 million individuals.

²⁶ The data includes approximately 48,000 displaced individuals, which is 2.3% of the original selection. Of these, 43,100, or 88.4%, are re-employed already in year t . The definition of 're-employed' is that the individual has a wage income of at least SEK 100 in November of year t .

prospects of finding a new job for those who had been employed there were not as bright as for those in the other sectors.

In conclusion, we have also studied wage income paths for those who lost their jobs compared to those who had been allowed to keep their jobs and principally whether there is any difference between if a person had previously (before being displaced) worked in tradable services, non-tradable services or manufacturing. In Figure 6.5 we have added curves showing the income paths we have estimated for these groups. In Appendix 3 we describe how these were created.

Figure 6.5 Impact of displacement on gross annual wage.



Remarks: Impact on income is estimated for individuals displaced between 2000 and 2005.

We can see from the figure that those people who suffer the greatest loss of income are those who in year $t-1$ were employed in manufacturing, i.e. they have an approximately 9% lower wage income than if they had kept their jobs. They are followed by those who before being displaced in tradable services (approximately 7% lower wage income) and those who had lost their jobs and previously worked in non-tradable services had the lowest loss of income (about 5%). Here again, it is thus those coming from manufacturing who are hardest hit.

In other words, it would appear that the wage premium that we find in tradable industries (Figure 6.4) to a certain degree can compensate for higher adjustment costs in these industries and in manufacturing in particular. Since adjustment costs seem to be lower in tradable services than in manufacturing (lower loss of income and higher probability of

being re-employed) it might also be of interest to look at how these sectors are distributed regionally. We have therefore investigated how employment in tradable services and manufacturing is distributed over local labour market regions.²⁷

6.3 Tradable services and local labour market regions

There also seems to be great variation between different regions as regards how large a proportion of those employed work in tradable services and how large a proportion are employed in manufacturing. As regards tradable services, the proportion is greatest in Stockholm with a little over 34%, while the proportion in Eda is only 5.5%. In manufacturing, Fagersta has the largest proportion with almost 40% and Arjeplog the smallest, only 2%. In Stockholm, on the other hand, the proportion of people employed in manufacturing is low (6.1%) and the same is true of tradable services in Fagersta (5.6%). A complete list of employment distribution in all local labour market regions can be found in Table A4.1 in Appendix 4.

Tradable services are also concentrated to the regions with the most jobs. We can see this in Figure 6.5, where we have plotted the relationship between the number of people in work and the share of people employed in tradable service industries at regional level. The positive correlation is quite obvious (0.6). No corresponding pattern can be found if we instead, as we have done in Figure 6.6, plot the relationship between the number of people in work and the proportion of people employed in manufacturing. Here the correlation is considerably less (0.1).

If we also estimate the correlation between the share of people employed in tradable service industries, on the one hand, and the proportion of people in work with post-secondary education and the number employed at regional level, on the other, the coefficient is positive and significant for both these factors. This means that tradable service industries seem to be concentrated to large regions with high population density and high human capital intensity. If we estimate a corresponding regression with the share of people employed in manufacturing none of the coefficients are significant.²⁸

²⁷ For a more detailed description of how the FA regions are defined, see ITPS (2008), pp. 195-203.

²⁸ Regression results for share of employed in tradable services ATS is

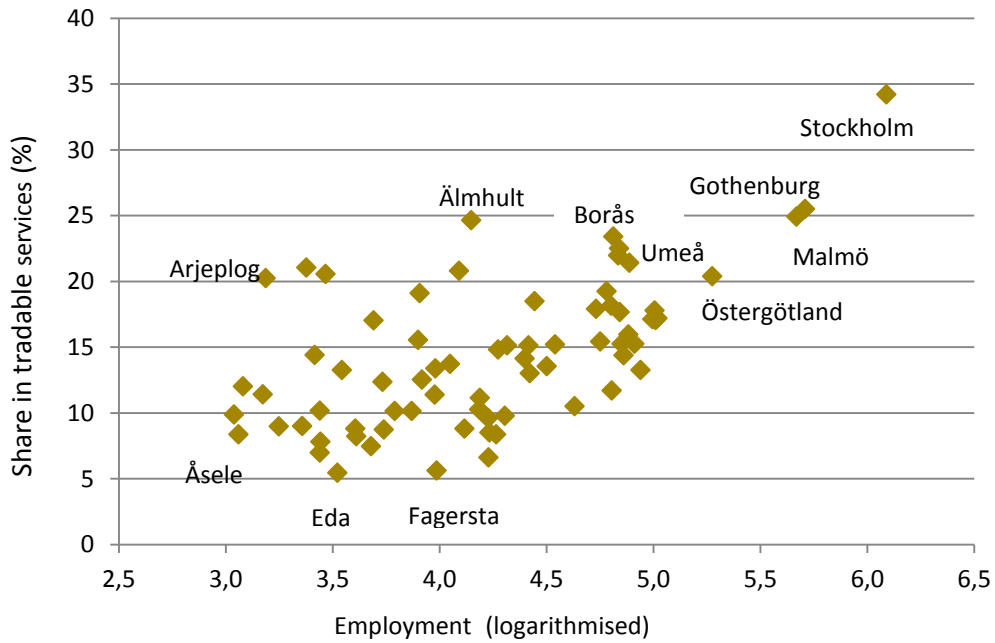
$$ATS = 0,735 + 0,517AH + 0,009SYS$$

where the t-ratio for proportion of highly educated AH is 6.09 and for the total number of people employed in the SYS region is 2.66. The corresponding regression for share of employed in manufacturing ATI gives

$$ATI = 23,92 - 0,234AH - 0,002SYS$$

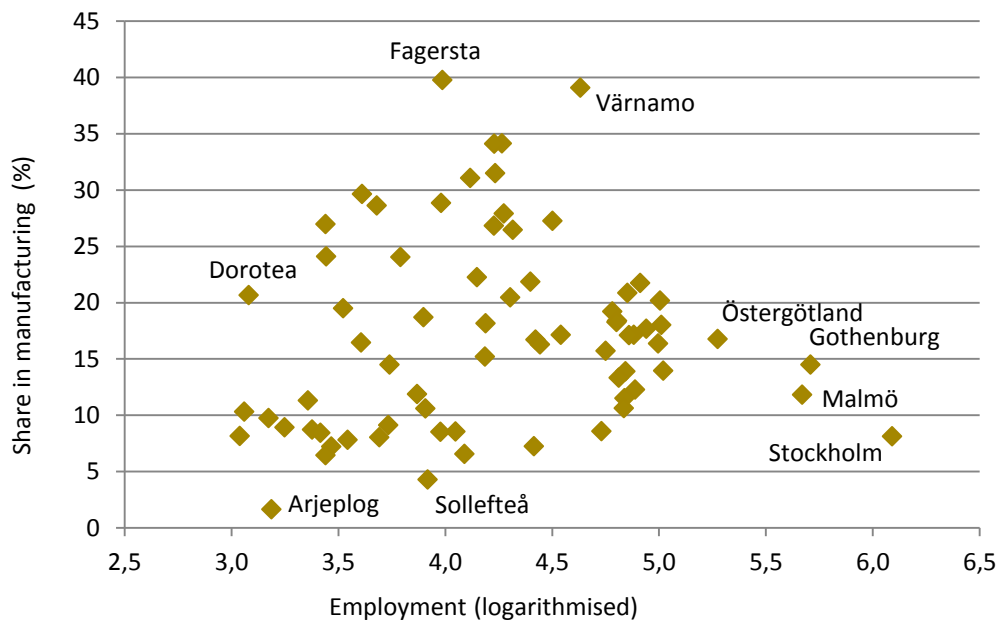
where the t-ratio for AH is -1.17 and for SYS is -0.25.

Figure 6.5 Correlation at regional level between size (no. employed) and share employed in tradable services, 2010.



Source: Statistics Sweden, Register-based labour market statistics (RAMS).

Figure 6.6 Correlation at regional level between size (no. employed) and share employed in manufacturing, 2010.



Source: Statistics Sweden, Register-based labour market statistics (RAMS).

What, then, might be the reason for the strong correlation that appears to exist between the size of a region and the proportion of people employed in tradable service industries? It is probably the strong agglomeration effects that cause businesses in tradable services to be drawn to regions with high population density. The companies can take advantage of a large pool of labour with exactly the skills they need (usually with a high level of education). The labour, on the other hand, values the greater opportunities offered in large regions to move between different employers. Prospects for co-locating with other companies and labour in similar types of business are better in large, densely populated regions, which constitutes considerable potential for knowledge and information exchange (local knowledge spillovers). These are not least important in information- and knowledge-intensive industries, which the tradable service sector largely consists of. Another factor is probably the more varied supply of activities (culture, sport, restaurants and opportunities for further education) that large, densely populated regions can offer and which tend to attract more highly educated labour. It can also be noted that these regions have in recent years come to be characterised by considerable dynamics and growth.²⁹

If service trade continues to grow as it has done recently, for example through lowered obstacles to trade in services or further technological advances that promote that type of trade, there is every reason to expect that the large, densely populated regions will continue to benefit from this as exports from companies in tradable services grows. Since Sweden seems to have comparative advantages in these parts of the business sector, it is also less likely that they will suffer as much pressure from import competition from low-wage countries as large parts of the manufacturing industry are today and presumably will continue to be in the immediate future.

²⁹ *It can be seen from table 3-4 in ITPS (2008) that growth in labour productivity between 1995 and 2005 was higher in large, densely populated regions.*

7 Concluding remarks

Especially in the expanding tradable services sector there are many industries where the proportion of skilled labour is very high, for example in technical consulting and IT and communication services. But also in manufacturing the number of white-collar jobs is increasing while the traditional industrial tasks are decreasing; a development that not least characterises those industrial companies who are particularly successful in the export markets.³⁰ Sweden and many other developed countries with relatively good access to skilled labour seem to have comparative advantages in these parts of the economy. At the same time there seems to be considerable scope for expansion and export growth in these industries. There is probably an increasing demand for the services produced in these industries in many of the fast-growing, less developed countries and when they begin to manufacture increasingly advanced industrial goods then the demand for skilled business, professional and technical services, for example, as input to this production, will also increase. In order for these countries to be able to also maintain their high rate of growth in the future, considerable investment is needed in the physical infrastructure, for example in the form of roads, bridges, ports, airports, telecommunication and energy systems, and in this regard the specialised knowledge that the tradable service sector in developed countries like Sweden can provide can complement local resources.³¹

The obstacles to trade in services, however, are still relatively high in many of these large, fast-growing countries. These may be restrictions as regards foreign investment, demand for local content in production, and often high administrative costs. To try to eliminate or at least reduce such obstacles to trade in services, it might be possible for these fast-growing, less developed countries to gain access to the most refined and advanced business, professional and technical services at a relatively low cost at the same time as developed countries like Sweden can benefit from their comparative advantages and export these services.

If this does occur and the trend towards continued expansion of tradable services while the manufacturing shrinks is maintained, what impact can this be expected to have on employment at regional level? Since the tradable service industries are concentrated to large, densely populated regions with a high share of skilled labour, it seems reasonable to believe that these regions will continue to expand. Smaller regions, on the other hand, where jobs are mainly in manufacturing will probably be more vulnerable.

Lower communication and information costs have made it easier to shift various activities within the global value chains between countries. Many production factors, like financial capital and knowledge, have also become more mobile. This means for example that subsidies for R&D, motivated by the positive external effects that R&D is expected to give rise to, do not necessarily go to the subsidising country but leak away to other countries. The knowledge that a company acquires through its R&D in Sweden, partly funded through Swedish R&D subsidies, need not therefore benefit Sweden but be used instead by subsidiaries or other companies located in other countries.

³⁰ *Lodefalk (2012).*

³¹ *A similar argument for the USA can be found in Jensen (2011).*

One factor that on the other hand has the attractive combination of low mobility and large, positive spillover effects is human capital.³² Even if highly educated labour moves between countries, it is much more strongly bound to the country that has paid for their education than financial capital or the results of basic research. The fact that the return on national investments, for example in the form of subsidies for higher education, tends to a great extent to remain in the investing country is an attractive trait for policy makers. Another attractive characteristic of human capital is that those parts of the value chains that create the highest value added are also normally the ones that are most human capital intensive. Agglomeration effects also often arise in these activities, which means that companies can pay higher wages (wage premiums). Highly educated labour is also more flexible. This means that it can move between sectors and activities relatively easily and thus adapt to structural changes.³³

³² Both Moretti (2012) and Baldwin and Evenett (2012) contain interesting discussions of the importance of human capital in the 21st century.

³³ One indication of this is that highly educated people who have lost their jobs can find new employment more easily than those with only medium-long or short education (see table A2.1 in Appendix 2).

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Appendix 1 Does China really have comparative advantages in production of high-tech products?

Indicators of competitiveness based on export values, for example Balassa's revealed comparative advantage (RCA),³⁴ tend to give a misleading picture of a country's competitiveness in the manufacture of a product when the country is specialised in the final assembly of that product and where input goods and services for the product for the most part are imported. This means that on the basis of these indicators it is then possible to draw erroneous conclusions about a country's comparative advantages. Let us try to show what we mean with the help of a concrete example.

Table A1.1 shows how RCA has developed for the "Office and telecommunication equipment" product group in Sweden and China from the mid-1980s up to today.

Table A1.1 RCA in office and telecom equipment in Sweden and China, 1985-2011.

| Year | China | Sweden |
|------|-------|--------|
| 1985 | 0.22 | 0.88 |
| 1990 | 0.89 | 0.70 |
| 1995 | 1.01 | 0.75 |
| 2000 | 1.19 | 1.05 |
| 2005 | 1.85 | 0.78 |
| 2011 | 1.92 | 0.84 |

Remarks: Office and telecom equipment includes SITC codes 75, 76 and 776.

Source: WTO statistics database.

Judging from the table, China seems to have considerably improved its international competitiveness in this product group and a value that clearly exceeds 1 in 2011 suggests that the country has a strong position in the world market today. Sweden on the other hand has remained at roughly the same level over the entire period. Since the product group is normally regarded as high-tech, this development might be misinterpreted as saying that China nowadays also has comparative advantages in high-tech production. In addition to this, those who claim that China is already a serious competitor to the most developed countries usually also point to the fact that China has more graduate engineers than the USA and that the total outlays on R&D expenditure in China is large and has grown rapidly in recent years.

Our main objection to this argument is that according to international trade theory (the Heckscher-Ohlin model) it is the *relative* factor endowments, and not the absolute endowments, that determine a country's international specialisation³⁵ and it can then be

³⁴ RCA measures a country's export share of a product group relative to the country's share of total exports. If RCA is greater than 1, it constitutes an indication that the country is internationally competitive in production of the product (see also footnote 15).

³⁵ For China, which is a large country with a substantial need to improve its infrastructure and build new homes and office and business premises, it is perhaps not a particularly wise decision to concentrate its relatively (in relation to its total workforce) few engineers to the high-tech industry.

seen from table A1.2 that although China has come closer to Sweden it still lags some way behind when it comes to average length of education of people over 25.

Table A1.2 Average length of education of population over 25 years of age in Sweden and China.

| Year | China | Sweden |
|------|-------|--------|
| 1985 | 4.3 | 9.5 |
| 2010 | 7.5 | 11.6 |

Source: Barro och Lee (2010).

Koopman et al. (2010) recalculated the RCA for a number of products where instead of the exports' production values they use the domestic value added in the exports. A comparison of RCA between countries when they use either production values or value added, China's position falls in many groups for RCA based on value added at the same time as several developed countries' position improves.

This has probably to do with the fact that China, with relatively good availability of unskilled labour, has taken over the final assembly of products in the Asian network that has emerged in recent years. More technologically advanced countries like Japan, South Korea and Taiwan have come to specialise in the manufacture of components for these products – often with a high value added – which they then ship to China for assembly. Herein probably lies the reason why Chinese exports are to an increasing degree showing similarities with developed countries' exports³⁶ – a more sophisticated export supply – which might also largely be attributable to the increased importance of the value chains. In particular with regard to what are normally considered to be high-tech industries Chinese exports consist of products manufactured in overseas subsidiaries with a large content of advanced input goods imported from developed economies.³⁷ Global value chains and foreign influence, in terms of imported input goods and foreign direct investments, have thus played a crucial role in China's spectacular export development as regards size, composition and quality.

³⁶ Schott (2008).

³⁷ Brantstetter and Lardy (2006), Xu och Lu (2009) and Amiti and Freund (2010)

Appendix 2 Estimates of probability of displacement and re-employment

Here we present the results of the probit estimates on which the summarising table 6.2 is based.

Table A2.1 Probit estimates of the probability of displacement and re-employment, 2000-2009.

| Explanatory variables | $Pr(Displaced = 1)$ | | $Pr(Reemployed = 1)$ | |
|-------------------------------|---------------------|----------|----------------------|----------|
| Manufacturing | 0.0772 | (12.70) | -0.1153 | (-5.41) |
| Tradable services | 0.2445 | (47.26) | 0.1052 | (5.43) |
| Age | -0.0161 | (-12.33) | 0.1443 | (30.84) |
| (Age) | 0.0001 | (7.10) | -0.0018 | (-31.69) |
| Men | 0.0821 | (19.01) | 0.2466 | (15.31) |
| Short education | 0.0137 | (2.08) | -0.2663 | (-10.79) |
| Medium-long education | 0.0114 | (2.48) | -0.0806 | (-4.34) |
| Private sector | 0.3412 | (58.23) | 0.1264 | (5.79) |
| Size: 50-99 employees | -0.1105 | (-19.65) | 0.0399 | (1.84) |
| Size: 100-199 employees | -0.1545 | (-24.86) | 0.0855 | (3.47) |
| Size: 200-499 employees | -0.1814 | (-27.22) | 0.1468 | (5.52) |
| Size: More than 500 employees | -0.3939 | (-57.06) | 0.2181 | (7.05) |
| Region dummies | Yes | | Yes | |
| Time dummies | Yes | | Yes | |
| Pseudo-R ² | 0.0568 | | 0.0664 | |
| No. of observations | 2,078,377 | | 48,602 | |

Remarks: The coefficients for manufacturing and tradable services describe the difference compared to non-tradable services, the education coefficients the difference in relation to long education and the size coefficients the difference in relation to the size of plants with 10-49 employees. Short education is defined as only compulsory school, medium-long as upper secondary school and long education some form of post-secondary education. Dummies for regions are National districts.

Regarding the likelihood of displacement, we can see, not entirely unexpectedly, that it was higher in the tradable part of the economy. Somewhat more surprisingly, we find that it was easier to lose one's job in tradable services than in manufacturing during the period studied, i.e. between 2000 and 2009. The relationship between age and likelihood of displacement is negative; the older the person the lower the likelihood, but the correlation is non-linear; the negative effect declines with increasing age. The risk of losing one's job

is greater for men and people who work in the private sector and the larger the workplace the lower the likelihood of being displaced. Finally, it would seem that people with the highest level of education have run the lowest risk of displacement. It can also be added that for people working in Stockholm the probability of being displaced was higher than in other regions in Sweden (this cannot be seen from table A2.1).

Regarding the probability of being re-employed, it was easiest for those who previously worked in tradable services to find a new job and hardest for those who were displaced in manufacturing. The older the person the easier it was to find a new job, but just like the probability of losing one's job the correlation is non-linear; the positive effect declines with increasing age. For men and people who had worked in the private sector, the probability of being re-employed was higher. It also seems that the longer the education a displaced person has the higher the probability of finding new work. People who had worked at larger plants found it easier to find new employment. Finally, it was easier for people displaced in the Stockholm region to find a new job than people displaced in other regions (again, this cannot be seen from table A2.1).

Appendix 3 Effects of displacement on gross annual wage: Data and methods of generating wage income paths

In order to estimate the wage income paths shown in figure 6.5 we created a group of individuals who were displaced between year $t-1$ and t (the treatment group) and a group of individuals who kept their jobs between year $t-1$ and t (the comparison group).

The term ‘displaced’ is used, as in the probit analysis in Appendix 2, to refer to an individual who has been separated from a plant between year $t-1$ and year t , i.e. was employed at the workplace in year $t-1$, but was not employed at the plant in year t . The plant must also have undergone one of the following two events: large-scale dismissals or closure. ‘Large-scale dismissals’ means that the plant has experienced an absolute reduction in employment of five employees or more and a relative reduction in employment of 30% or more between year $t-1$ and year t . ‘Closure’ means that the plant ceased to exist between year $t-1$ and year t . The point of time of displacement refers to year t .

For each of the years between 2000 and 2005, we have put together population cohorts of individuals from the treatment and comparison groups. The individuals in our data satisfy a number of restrictions. This means that: (i) at time $t-1$ the individuals must be between 25 and 54 years of age; (ii) they must be employed, which excludes company owners, self-employed people and people who carry out unpaid work at home; (iii) they must have worked for their present employer for a fairly long period (have been employed at the same plant in year $t-1$ and year $t-2$, and (iv) they must be employed at a plant with 10 or more employees.

Each cohort contains between 1.43 and 1.52 million individuals. From each cohort we extracted a random selection of 10%, which gives us six selection cohorts of between 143,000 and 150,000 individuals each. When we stack these we obtain panel data material containing 8.84 million observations for 884,000 individuals (10 observations for each individual for years $t-5$ to $t+4$). On average, the displacement rate in this material for 2000 to 2005 amount to 2.8%. This means that in our selection we have approximately 25,000 people who were displaced and 895,000 who were not.

We also added the restriction that each individual must remain in the panel for all years between $t-5$ and $t+4$ and wage incomes must be positive for at least one of the years t to $t+4$. The wage incomes are stated in 2009 prices and we used Statistics Sweden’s consumer price index as deflator.

To generate wage income paths, we estimated the following regression model:

$$y_{it} = \alpha_i + \gamma_t + \sum_{k=-3}^4 D_{it}^k \delta_k + \sum_{k=-3}^4 C_{it}^k \theta_k + \varepsilon_{it} \quad (1)$$

where

y_{it} is the annual real wage income for the cohort individual³⁸ i at time t ;

³⁸ Note that the same individual may occur in several cohorts.

D_{it}^k is a number of of dummy variables that are intended to capture the dynamics in connection with displacement: $D_{it}^k = 1$ if, at time t , individual i had been displaced k years earlier, where k ranges from -3 to 4;

δ_k is the effect of displacement on an individual's wage income k years after it took place;

C_{it}^k is a number of dummy variables that are related to each individual year in the cohort; $C_{it}^k=1$ at time t for all individuals, where k ranges from -3 to 4;

θ_k captures wage development for non-displaced individuals during the period closest to the occasion of the displacement and immediately after it:

γ_t are the coefficients for the dummy variables for each calendar year in the period studied. The purpose of these year dummies is to control for the general wage development in the Swedish economy over these years;

α_i are fixed effects at individual level;

ε_{it} is a residual that is assumed to have constant variance and to be uncorrelated over the cohort individuals, but may be correlated between one and the same individual who occurs in several cohorts.

The regression model in equation (1), which is a fixed-effect model, is estimated separately for individuals who at time $t-1$ are employed in tradable services, manufacturing and non-tradable services. The wage income paths illustrated in figure 6.5 are then plotted according to these estimates.

Appendix 4 Distribution of employment in regions by tradable services, manufacturing and skilled labour

Table A4.1 Share of regional employment in tradable services and in manufacturing, share with post-secondary education and number employed in local labour market regions (FA regions) 2010.

| FA region | FA code | Share tradable services (%) | Share manufacturing (%) | Share post-secondary education (%) | Total employment |
|----------------|---------|-----------------------------|-------------------------|------------------------------------|------------------|
| Stockholm | 1 | 34.2 | 8.1 | 46.0 | 1,230,269 |
| Gothenburg | 21 | 25.5 | 14.5 | 42.3 | 511,765 |
| Malmö | 19 | 24.9 | 11.8 | 40.5 | 466,868 |
| Älmhult | 9 | 24.7 | 22.2 | 30.6 | 14,060 |
| Borås | 22 | 23.4 | 13.3 | 32.8 | 64,841 |
| Umeå | 61 | 22.5 | 11.5 | 45.6 | 69,014 |
| Sundsvall | 49 | 22.0 | 10.6 | 35.1 | 68,487 |
| Luleå | 65 | 21.4 | 12.3 | 36.7 | 77,252 |
| Jokkmokk | 70 | 21.1 | 8.7 | 26.4 | 2,379 |
| Kiruna | 72 | 20.8 | 6.6 | 26.3 | 12,312 |
| Arvidsjaur | 63 | 20.6 | 7.2 | 26.2 | 2,927 |
| Östergötland | 4 | 20.4 | 16.8 | 37.1 | 188,061 |
| Arjeplog | 64 | 20.3 | 1.6 | 23.8 | 1,535 |
| Blekinge | 17 | 19.3 | 19.2 | 36.6 | 60,375 |
| Ljusdal | 48 | 19.1 | 10.6 | 22.6 | 8,066 |
| Nyköping | 2 | 18.5 | 16.3 | 31.4 | 27,767 |
| Växjö | 11 | 18.2 | 18.3 | 35.7 | 63,291 |
| Östersund | 53 | 17.9 | 8.6 | 34.0 | 53,840 |
| Västerås | 37 | 17.8 | 20.2 | 35.4 | 101,115 |
| Falun/Borlänge | 42 | 17.7 | 13.9 | 34.1 | 69,672 |
| Örebro | 34 | 17.2 | 13.9 | 35.2 | 104,610 |
| Karlstad | 30 | 17.1 | 16.4 | 34.8 | 98,945 |
| Jönköping | 6 | 17.1 | 18.0 | 34.6 | 102,332 |
| Härjedalen | 54 | 17.0 | 8.0 | 21.2 | 4,911 |
| Halmstad | 20 | 16.0 | 17.1 | 32.2 | 76,272 |
| Kramfors | 50 | 15.5 | 18.7 | 26.0 | 7,918 |
| Kalmar | 12 | 15.4 | 15.7 | 33.3 | 56,323 |
| Skövde | 25 | 15.3 | 21.7 | 29.8 | 81,466 |
| Gävle | 45 | 15.3 | 20.9 | 33.4 | 70,975 |
| Skellefteå | 62 | 15.2 | 17.1 | 32.7 | 34,724 |
| Oskarshamn | 15 | 15.1 | 26.5 | 26.9 | 20,708 |
| Gotland | 16 | 15.1 | 7.2 | 30.0 | 26,010 |
| Karlskoga | 36 | 14.8 | 27.9 | 29.3 | 18,784 |
| Storuman | 55 | 14.4 | 8.4 | 25.7 | 2,602 |
| Kristianstad | 18 | 14.4 | 17.1 | 31.7 | 72,405 |
| Örnsköldsvik | 52 | 14.1 | 21.9 | 32.5 | 24,988 |
| Strömstad | 26 | 13.7 | 8.5 | 23.4 | 11,176 |
| Lidköping | 24 | 13.6 | 27.2 | 27.7 | 31,674 |
| Tranås | 8 | 13.4 | 28.8 | 24.3 | 9,552 |
| Trollhättan | 23 | 13.3 | 17.7 | 32.7 | 87,110 |
| Haparanda | 68 | 13.3 | 7.8 | 23.8 | 3,496 |

Table A4.1 continued

| FA region | FA code | Share tradable services (%) | Share manufacturing (%) | Share post-secondary education (%) | Total employment |
|----------------|---------|-----------------------------|-------------------------|------------------------------------|------------------|
| Söderhamn | 46 | 13.0 | 16.7 | 24.6 | 26,416 |
| Sollefteå | 51 | 12.5 | 4.3 | 28.9 | 8,268 |
| Malung | 40 | 12.4 | 9.1 | 20.7 | 5,405 |
| Dorotea | 57 | 12.0 | 20.7 | 18.4 | 1,205 |
| Eskilstuna | 3 | 11.7 | 18.4 | 32.0 | 63,762 |
| Överkalix | 66 | 11.4 | 9.7 | 20.3 | 1,489 |
| Gällivare | 71 | 11.4 | 8.5 | 23.6 | 9,498 |
| Västervik | 14 | 11.2 | 18.2 | 29.0 | 15,440 |
| Värnamo | 5 | 10.5 | 39.1 | 23.7 | 42,854 |
| Mora | 41 | 10.3 | 15.2 | 26.6 | 15,343 |
| Vilhelmina | 58 | 10.2 | 6.4 | 25.1 | 2,751 |
| Bengtstorsfors | 27 | 10.2 | 24.0 | 22.0 | 6,167 |
| Lycksele | 56 | 10.1 | 11.9 | 28.7 | 7,390 |
| Sorsele | 60 | 9.9 | 8.2 | 22.9 | 1,092 |
| Hudiksvall | 47 | 9.8 | 20.5 | 28.2 | 20,151 |
| Avesta | 43 | 9.6 | 26.8 | 24.2 | 16,868 |
| Pajala | 69 | 9.0 | 11.3 | 24.7 | 2,275 |
| Övertorneå | 67 | 9.0 | 8.9 | 25.1 | 1,770 |
| Vimmerby | 13 | 8.8 | 31.1 | 22.1 | 13,082 |
| Årjäng | 28 | 8.8 | 16.5 | 18.8 | 4,030 |
| Torsby | 31 | 8.7 | 14.5 | 26.0 | 5,491 |
| Ludvika | 44 | 8.5 | 31.5 | 27.3 | 17,126 |
| Ljungby | 10 | 8.4 | 34.1 | 25.6 | 18,401 |
| Åsele | 59 | 8.4 | 10.3 | 21.8 | 1,145 |
| Filipstad | 33 | 8.2 | 29.6 | 20.2 | 4,078 |
| Vansbro | 39 | 7.8 | 24.1 | 19.8 | 2,771 |
| Hagfors | 32 | 7.5 | 28.6 | 21.5 | 4,777 |
| Hällefors | 35 | 7.0 | 27.0 | 21.6 | 2,755 |
| Vetlanda | 7 | 6.6 | 34.1 | 23.0 | 16,946 |
| Fagersta | 38 | 5.6 | 39.8 | 23.0 | 9,675 |
| Eda | 29 | 5.5 | 19.5 | 20.2 | 3,330 |
| Total | | 23.4 | 14.0 | 38.4 | 4,392,628 |

The Swedish Agency for Growth Policy Analysis (Growth Analysis) is a cross-border organisation with 60 employees. The main office is located in Östersund, Sweden, but activities are also conducted in Stockholm, Brasilia, New Delhi, Beijing, Tokyo and Washington, D.C.

Growth Analysis is responsible for growth policy evaluations and analyses and thereby contributes to:

- stronger Swedish competitiveness and the establishment of conditions for job creation in more and growing companies
- development capacity throughout Sweden with stronger local and regional competitiveness, sustainable growth and sustainable regional development.

The premise is to form a policy where growth and sustainable development go hand in hand. The primary mission is specified in the Government directives and appropriations documents. These state that the Agency shall:

- work with market awareness and policy intelligence and spread knowledge regarding trends and growth policy
- conduct analyses and evaluations that contribute to removing barriers to growth
- conduct system evaluations that facilitate prioritisation and efficiency enhancement of the emphasis and design of growth policy
- be responsible for the production, development and distribution of official statistics, facts from databases and accessibility analyses.

About the Working paper/Memorandum series:

Some examples of publications in the series are method reasoning, interim reports and evidential reports.

Other series:

Report series – Growth Analysis' main channels for publications.

Statistics series – continuous statistical production.

Svar Direkt [Direct Response] – assignments that are to be presented on short notice.