
Shifts in manufacturing: an illustrative study on passenger car production location

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Abstract: This paper examines to what extent the international transfer of production activities is real or generalisable by analysing the location shifts in passenger car manufacturing since 1997. The findings illustrate that there is no conclusive evidence that passenger car manufacturing is relocated from high labour cost towards low labour cost countries.

Keywords: internationalisation; production location; international manufacturing.

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1 Introduction

Over the past few years, it has been frequently reported that many jobs are being transferred to low labour cost countries. Recently, it was emphasised that white-collar jobs are being transferred to low labour cost countries (Cox News Service, 2003; Moran, 2003; Skapinker, 2003). This is in line with an already existing trend; the transfer of blue-collar jobs to low labour cost countries, in particular manufacturing jobs. The perceived negative side of these trends is that it leads to a loss of regional employment, which worries politicians in the industrialised countries (Engardio et al., 2003; Sowa, 2003). Furthermore, media messages often create the image that industrialised countries such as the USA and those in Europe are no longer competitive in manufacturing compared to the low labour cost countries. We have experienced this through communication with the company representatives, students and the general public. However, is the trend of moving a significant amount of (manufacturing) jobs away from the developed countries real? There is some evidence that it may be a perceived loss of jobs. For example, Ferdows (1997a) stated:

A popular view is that manufacturing is leaving the industrialized countries and going to the developing countries. This notion is propagated every time one reads that a multinational company establishes a factory in a developing nation. These events are usually well publicized in the media. However, an investment several times larger by the same multinational company, expanding its manufacturing facilities in a highly industrialized country, often goes unnoticed by the general public.

International manufacturing has been investigated from different perspectives. Economists have been concerned with investigating trade and Foreign Direct Investment (FDI) patterns. Vernon (1966) and Vernon and Wells (1991) show that production initially takes place in innovative countries such as the USA with trade towards other regions. Later in the product life cycle production is shifted to less developed countries with trade to the original innovating country. Gereffi and Korzeniewicz (1994) and Gereffi (1999) provide examples of production location shifts in particular for the textile industry. Van Liemt (1992) provides several other industry examples and impacts on employment levels. Dunning (1988, 2000) provides an explanation of why FDI occurs, which relates to ownership-, locational- and internalisation advantages. Braunerhjelm and Ekholm (1998) provide similar insights into the advantages of certain location such as proximity to market or existing knowledge bases.

Operations Management researchers have also been interested in international manufacturing and location issues. For example, the issue of where to locate a new plant (Bartmess, 1994; Brush et al., 1999; Verter and Dincer, 1992). Ferdows (1997a) examined FDI patterns and concluded that the industrialised countries continue to attract more manufacturing investment from abroad every year in amounts far greater than the developing countries. Ferdows (1989, 1997b) and Vereecke and van Dierdonck (2002) provide insight into the different roles that companies can perform inside a multinational company with several production plants. They also show that companies have three primary strategic reasons to open an international plant: proximity to market, access to low-cost production and access to skills and knowledge. Although other strategic reasons may exist, for example to earn export credits and although these reasons are not necessarily mutually exclusive, Vereecke and van Dierdonck (2002) found that these three encompass the vast majority of plants and access to low-cost production is the most

important factor. Other areas of research have included related topics such as manufacturing networks (e.g. Boone et al., 1996; Meijboom and Vos, 1997; Nassimbeni, 1998; Shi and Gregory, 1998) and global sourcing (see e.g. Bozarth et al., 1998; Kotabe, 1989; Kotabe and Murray, 1990; Kotabe and Swan, 1994; Swamidass and Kotabe, 1993).

Literature shows the complexity of international manufacturing through the many issues that play a role. This complexity may contribute to the general public misunderstanding (as indicated by us earlier) that industrialised nations can no longer compete in manufacturing.

Unless outsourcing is involved, there is not necessarily a trend where manufacturing is leaving industrialised nations. Even in the case of outsourcing, it may simply mean replacement of lower value-added activities (that are outsourced) with higher value-added activities (new products that are manufactured at home). Also, FDI does not necessarily mean that industrialised countries are losing their manufacturing base. Research on FDI patterns highlights financial investments but financial investments provide circumstantial evidence for production shifts. The purchase of an existing foreign facility depicts a change in financial ownership but is not necessarily accompanied by a change in production at home. If for example, a US company purchases a Chinese company, but does not change its production, the total world production has not changed and jobs have not moved to or away from the USA. If the investment concerns a Greenfield plant, this then still is not necessarily accompanied by lower production rates at home since the new plant may be built to be able to fulfil increasing demand (it is possible that a Greenfield plant is accompanied by lower production rates in for example the USA, if the new plant produces cars that were previously exported from the USA). FDI patterns at best give a very marginal picture of shifts in production location.

Another issue is the misconception that low labour cost countries provide cheaper overall production costs. Ferdows (1997b) and Vereecke and van Dierdonck (2002) show that access to lowcost production (including low-cost labour) is the most important motivator for FDI but Markides and Berg (1988) show that low labour cost does not necessarily mean overall lower production cost and the divestment literature shows that FDI may be less profitable than expected by managers (Benito, 1997; Boddewyn, 1979; Jagersma and van Gorp, 2003; Tornedon and Boddewyn, 1974).

In this paper, we take a step back from the current existing literature that has focussed on explaining shifts in production patterns and reasons for companies to locate production overseas. Instead, we conduct a data-driven analysis to determine whether we can conclude that production is being relocated from high labour cost countries to low labour cost countries.

2 Methodology

To determine whether manufacturing shifts are real or perceived we selected one industry for our analysis purposes. Selecting one industry allows us to conduct analysis at several levels. The industry we selected was the car manufacturing industry. This is a type of industry frequently associated with a shift in manufacturing activities from the developed countries to the developing countries. It is also a very large industry, spread both over developed and emerging economies. It is, therefore, a suitable industry for

investigating this phenomenon. However, it should be noted that we do not claim that this industry is representative for all types of industries. The selection of this industry is purely for illustrative purposes.

The focus of our research is to determine whether, in the past few years, there are indications that passenger car manufacturing has relocated from high labour cost regions to low labour cost regions. In other words, the issue is whether, in general, the industrialised nations are losing their manufacturing base to low labour cost regions. Consequently, we are not simply interested in location-related market shares of production but rather in the real, or absolute, production figures. For example, if passenger car markets in developing countries are growing, then this may be a reason to increase local production. This increase is not necessarily accompanied by a decrease in production at another location, for example, an industrialised country. We focus at whether, in an absolute sense, conclusions can be drawn about decreasing production in high labour cost regions while simultaneously an increase in production in low labour cost regions occurs. This would clearly indicate that production is relocated from high labour cost regions to low labour cost regions.

Our focus is on passenger car manufacturing and we consider the location where the final product, that is, the car, is produced. From now on passenger cars will be labelled as 'cars'. We are not looking at outsourcing activities or shifts in supplier locations. This does not mean that these are not important but at this time we are primarily interested in the location of the assembly lines where cars come out of a factory.

In our analysis we are also not concerned with the market location for these cars, for example, as seen in trade patterns, but only look at the production quantities in specific locations. We also do not look at levels of employment, that is, production levels may remain the same while employment is decreasing due to technology improvements. Although this is certainly an important issue, we focus purely on car production figures. We realise that these choices present a simplification of the complexity of international manufacturing. However, in this first-order analysis we are not interested in 'explanations' such as shifts due to for example proximity to market or cost reasons, etc. We are purely interested in the question as to where cars are produced and whether production locations are changing. Explanations of the patterns only become relevant if the patterns exist.

For data on car manufacturing the database from Organisation Internationale des Constructeurs d'Automobiles (OICA) was used. This data includes the manufacturing of complete cars as well as just the final assembly. It does not include supplier activities such as parts manufacturing. The research concerns the years 1997 until 2004, that is, the currently available data from the database. The OICA database information was checked against another database, that is, Ward's World Motor Vehicle data (Ward's Communications, 2001). These two sources show similar passenger car manufacturing figures.

3 Findings

The analysis is carried out at three levels. The first level of analysis is for different regions of the world, which coincides largely with high labour cost regions versus low labour cost regions. On the second level, individual countries are analysed and on the third level, car manufacturing companies are analysed.

3.1 Regional level

The OICA database was used to divide the world into seven regions. Three of these regions can be considered high labour cost regions: West Europe, North America (the USA and Canada) and Japan. The other four regions can be considered low labour cost regions: East and Central Europe (including CIS and Turkey), South and Central America (including Mexico), Asia-Oceania (excluding Japan) and Africa. Figure 1 provides an overview of the percentage of total world car production for each of these regions from 1997 to 2004, that is, it illustrates relative importance.

Figure 1 Regional share of world car production (based on OICA)

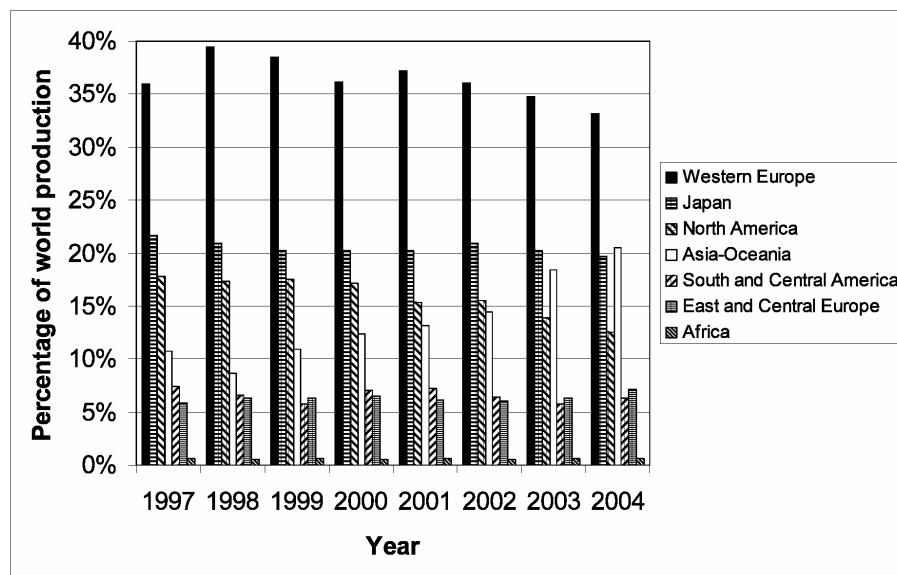


Figure 1 seems to confirm the news stories about shifts in production. It shows signs that total world car production is shifting from the developed and high labour cost regions to the developing and lower labour cost regions. West Europe, Japan and North America each have decreasing shares of world production while East and Central Europe and in particular Asia-Oceania have increasing shares of world production. South and Central America and Africa remained at a fairly constant percentage of world production.

However, although examining the importance of regions, as illustrated by percentage shares in world production, is insightful, it provides only relative production figures and not a complete picture. Furthermore, the fact that South and Central America and Africa had no increasing shares can be considered as an indication that production shifts are not simply from high labour cost regions to low labour cost regions. If this was true, then both of these regions would have witnessed increasing world production shares.

To increase our understanding, we next look at the number of cars produced in each of the regions, that is, in absolute numbers. Figure 2 provides an overview.

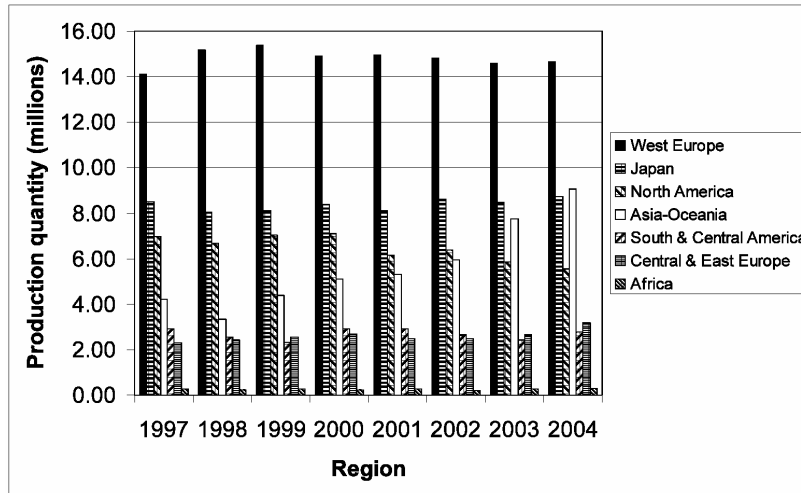
Figure 2 Car production in world regions (based on OICA)

Figure 2 illustrates important differences compared to Figure 1. For example although production in West Europe declined as a percentage of total world production (Figure 1), the total production increased from 1997 to 2004. Figure 2 shows that at the regional level, it cannot be concluded that in general production is shifting from high labour cost regions to low labour cost regions. Two high labour cost regions, that is, West Europe and Japan and three low labour cost regions, that is, South and Central America, East and Central Europe and Africa, show fairly stable total car production, that is, without a significant increasing or decreasing trend. The other two regions show trends. North American car production has decreased while Asia-Oceania car production has increased. Nevertheless, since this trend is only in two regions, it cannot be concluded that overall car production is shifting from high labour cost regions to low labour cost regions.

3.2 National level

In this section, a more detailed analysis is conducted at the country level. It is possible that within regions opposite effects compensated each other and it is also possible that within a region one particular country accounts for the majority of growth or decline. To analyse whether this occurred, the top-ten car producing countries in the world were selected.

In 1997, the top-ten countries were (in order): Japan, the USA, Germany, South-Korea, France, Spain, the UK, Brazil, Italy and Canada. Although their ranking changed, these ten countries remained in the top-ten until 2002. These countries together produced approximately 80% of all passenger cars in the year 1997–2002. In 2003, China entered the top-ten countries and Italy dropped off from this list. The ten countries from 2003 also remained in the top-ten car manufacturing countries in 2004. The ranking in 2004 was (in order): Japan, Germany, the USA, France, South-Korea, Spain, China, Brazil, the UK and Canada. These countries produced approximately 78% of the passenger cars in the world. Car production can therefore be considered as concentrated since only ten countries are responsible for over 75% of total world production.

Figure 3 illustrates the production quantities of passenger cars in the top car manufacturing countries. It includes the top-ten countries from 2004 and Italy was included since it was in the top-ten from 1997 to 2002.

Figure 3 Car production in top-ten countries (based on OICA)

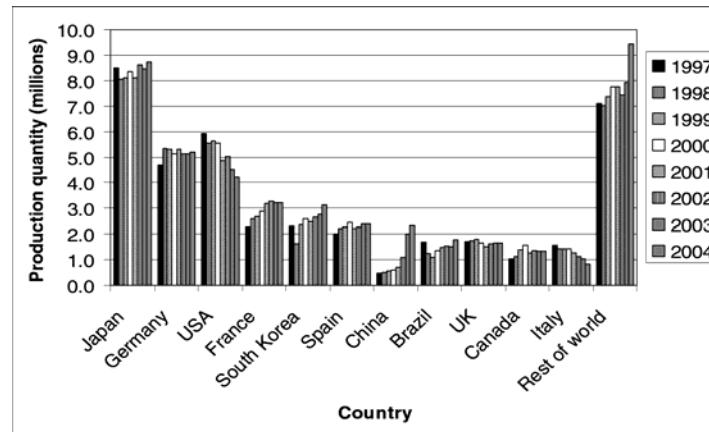


Figure 3 provides interesting results. Firstly, the production of passenger cars appears to have remained largely concentrated. Between 1997 and 2004, approximately 80% of world passenger car production was produced by the top-ten countries. Secondly, Figure 3 shows that 8 of the 11 countries between 1997 and 2004 are from high labour cost regions, that is, West Europe, Japan and North America. Finally, there is no immediate evidence of a general trend of transfer of passenger car production from high labour cost countries to low labour cost countries. This can be concluded since there is no conclusive evidence that for all high labour cost countries car production has reduced while at the same time all of the production in low labour cost countries output has increased. For example, from 1997 to 2004, a number of high labour cost countries such as Japan, Germany, France, Spain and Canada have increased the production of cars. The two developed countries with significantly reduced car production are the USA and Italy. Lower labour cost countries such as South Korea and China increased car production while Brazil produced an equal amount of cars in 1997 and 2004. So, although car production in China has become more important, we cannot conclude that in absolute numbers, the increase in China was accompanied by a decrease of production in high labour cost countries.

3.3 Company level

Our third level of analysis concerns individual manufacturers to analyse whether there are patterns for manufacturers of relocating production activities. For this analysis, the top-ten car manufacturing companies were selected. The OICA database provides data from 1998 to 2004 for individual manufacturers, therefore, these are the years included in the analysis. The top-ten passenger car manufacturing companies for 1998 were: General Motors, Volkswagen, Toyota, Ford, Fiat, Honda, Nissan, Renault, Daimler and PSA. These ten companies remained in the top-ten, although their order changed, until

Production quantity (million)

Region

Legend:

- 1990
- 1995
- 2000
- 2005
- 2010

Region	1990	1995	2000	2005	2010
West Europe	0.28	0.30	0.38	0.35	0.35
Central Europe	0.00	0.00	0.00	0.00	0.00
East Europe	0.00	0.00	0.00	0.00	0.00
USA	0.22	0.22	0.25	0.28	0.42
Canada	0.00	0.00	0.00	0.00	0.00
Mexico	0.15	0.15	0.28	0.28	0.28
Japan	1.35	1.20	1.20	1.25	1.20
Asia Oceania	0.08	0.08	0.10	0.12	0.12
South America	0.00	0.00	0.00	0.00	0.00
Africa	0.00	0.00	0.00	0.00	0.02

A bar chart titled "Production quantity (million)" on the y-axis and "Region" on the x-axis. The y-axis ranges from 0.00 to 1.40 in increments of 0.20. The x-axis lists ten regions: West Europe, Central Europe, East Europe, USA, Canada, Mexico, Japan, Asia-Oceania, South America, and Africa. A legend on the right side indicates the years corresponding to different bar patterns: 1996 (solid black), 1997 (diagonal lines /), 1998 (diagonal lines \), 1999 (white/unfilled), 2000 (horizontal lines), 2001 (vertical lines), 2002 (cross-hatch), 2003 (dotted), 2004 (wavy), 2005 (zigzag), and 2006 (checkered). Data is present for all regions from 1996 to 2000.

Region	1996	1997	1998	1999	2000
West Europe	0.10	0.12	0.15	0.18	0.20
Central Europe	0.00	0.00	0.00	0.00	0.00
East Europe	0.01	0.01	0.01	0.01	0.01
USA	0.70	0.68	0.65	0.82	0.81
Canada	0.18	0.17	0.37	0.38	0.39
Mexico	0.01	0.01	0.02	0.02	0.02
Japan	1.15	1.14	1.12	1.18	1.19
Asia-Oceania	0.05	0.15	0.16	0.32	0.48
South America	0.01	0.01	0.01	0.05	0.06
Africa	0.01	0.01	0.01	0.01	0.01

Production quantity (million)

Region

Legend:

- 1995
- 1996
- 1997
- 1998
- 1999
- 2000

Region	1995	1996	1997	1998	1999	2000
West Europe	0.00	0.00	0.00	0.00	0.00	0.00
Central Europe	0.00	0.00	0.00	0.00	0.00	0.00
East Europe	0.02	0.02	0.02	0.02	0.02	0.02
USA	0.00	0.00	0.00	0.00	0.00	0.00
Canada	0.00	0.00	0.00	0.00	0.00	0.00
Mexico	0.00	0.00	0.00	0.00	0.00	0.00
Japan	0.00	0.00	0.00	0.00	0.00	0.00
Asia-Oceania	0.95	1.65	2.05	2.25	2.35	2.40
South America	0.00	0.00	0.00	0.00	0.00	0.00
Africa	0.00	0.00	0.00	0.00	0.00	0.00

Figures 4–6 show that the three Japanese car manufacturers produce the majority of their cars in Japan. There is no apparent trend in a reduction of the importance of Japan as a production location measured by the number of cars manufactured in Japan. Toyota, Nissan and Honda also produce a significant percentage of cars in West Europe and the USA. Table 1 gives the production shares of the three manufacturers for the combined Japan, the USA and West Europe regions.

Table 1 Share of Japanese producers in Japan, West Europe and the USA (based on OICA)

	1998 (%)	1999 (%)	2000 (%)	2001 (%)	2002 (%)	2003 (%)	2004
Toyota	89.1	88.2	89.6	87.7	85.2	81.4	79.3
Honda	88.1	86.4	83.8	78.8	79.6	72.9	69.0
Nissan	89.3	88.3	82.9	81.4	81.1	83.2	82.4

Hyundai is not included in Table 1, as it produces almost exclusively in South-Korea. Similar to the comparison of Figures 1 and 2, Table 1 shows that relatively speaking Japan, West Europe and the USA have become less important for the Japanese producers whereas Figures 4–6 show that in absolute numbers most passenger cars are still produced in Japan, West Europe and the USA and production has not declined from 1998 to 2004. In other words, an increase in for example Asia-Oceania has not been accompanied by a decrease in production in Japan, West Europe and the USA.

Figures 4–6 show that for low labour cost regions, much production has increased in the Asia-Oceania region. Next, we look at where this increase occurred. Toyota's production in Asia-Oceania increased from 174,092 in 1998 to 647,890 in 2004, that is, an increase of 473,798. A large part of this increase is due to five countries: Thailand, Indonesia, China, India and Malaysia. Table 2 illustrates production figures from 1998 to 2004, which gives that these five countries combined increased Toyota's production in Asia with 370,637. This accounts for over 78% of Toyota's growth in Asia-Oceania.

Nissan's production in Asia-Oceania increased from 68,572 in 1998 to 130,087 in 2004, that is, an increase of 61,525. The majority of this increase takes place due to China. Table 3 illustrates production figures from 1998 and 2004, which gives that production increases in China increased Nissan's production in Asia with 62,070. This is more than the overall growth because there was a decline of production in Thailand and Taiwan.

Table 2 Toyota production in Asia-Oceania (based on OICA)

<i>Toyota</i>	<i>Asia-Oceania (total)</i>	<i>Thailand</i>	<i>Indonesia</i>	<i>China</i>	<i>India</i>	<i>Malaysia</i>
1998	174,092	12,731	929	0	0	0
2004	647,890	129,720	60,540	112,430	45,486	36,120
Increase	473,798	116,990	59,611	112,430	45,486	36,120

Table 3 Nissan's production in Asia-Oceania (based on OICA)

<i>Nissan</i>	<i>Asia-Oceania (total)</i>	<i>China</i>
1998	68,572	0
2004	130,087	62,070
Increase	61,515	62,070

Honda's production in Asia-Oceania increased from 64,854 in 1998 to 491,160 in 2004, that is, an increase of 426,160. A large part of this increase takes place in two countries: China and Thailand. Table 4 illustrates production figures from 1998 to 2004, which shows that these two countries combined increased Honda's production in Asia with 346,240. This accounts for over 81% of Honda's growth in Asia-Oceania.

For Toyota, Nissan and Honda combined production in Asia-Oceania rose from 307,518 to 1,296,137. The production increase in four countries contributed the most to this increase. Production in China, Thailand, Indonesia and India increased with 810,116, which accounts for approximately 85% of the total increase for Asia-Oceania (see Table 5).

Table 4 Honda production increases in Asia-Oceania (based on OICA)

<i>Honda</i>	<i>Asia-Oceania (total)</i>	<i>China</i>	<i>Thailand</i>
1998	64,854	0	13,700
2004	491,160	245,610	114,330
Increase	426,306	245,610	100,630

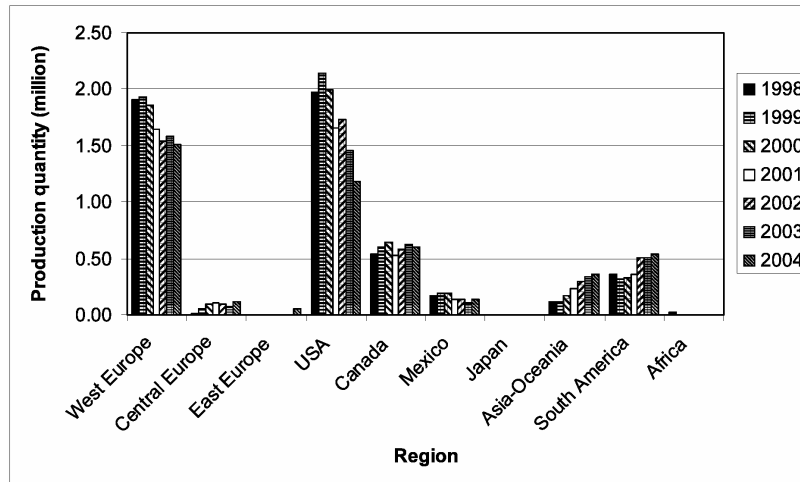
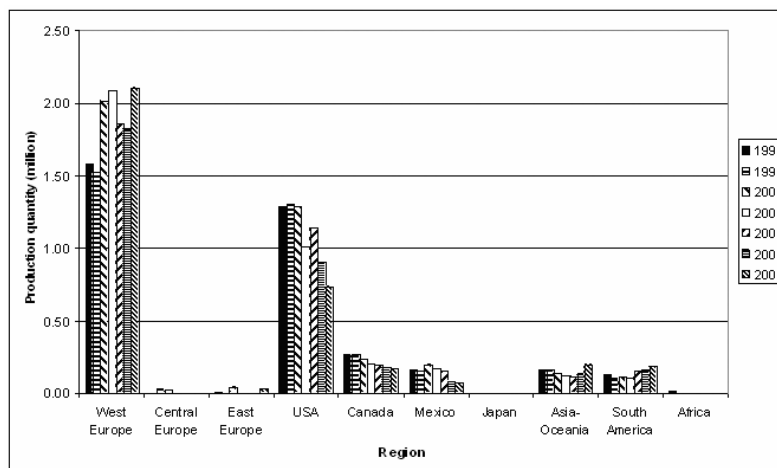
Table 5 Japanese manufacturers' production increases in Asia-Oceania (based on OICA)

<i>Combined</i>	<i>Asia-Oceania (total)</i>	<i>China</i>	<i>Thailand</i>	<i>Indonesia</i>	<i>India</i>
1998	307,518	0	29,040	2400	0
2004	1,269,137	420,110	244,050	96,000	81,396
Increase	961,619	420,110	215,010	93,600	81,396

Conclusion: Overall, it cannot be concluded that production from the Japanese manufacturers is shifting from high labour cost countries to low labour cost countries. Relatively (production shares) speaking, there are shifts but absolute production figures show that increases in low labour cost countries are not occurring simultaneously with decreases in production in high labour cost countries. Japan is still an important location for production for the Japanese producers. Furthermore, although production for the three Japanese manufacturers has increased dramatically in Asia-Oceania, most of this increase is in four countries. This indicates that low labour cost areas per se are not necessarily attractive but rather that specific locations that is, countries, offer attractiveness. It is also interesting to note that, as Figures 4–6 illustrate, Japanese manufacturers have increased their production in the USA from 1998 to 2004.

3.3.2 US producers

There are two US passenger car manufacturers in the top-ten, that is, General Motors and Ford. Their production locations are shown in Figures 8 and 9.

Figure 8 General motors production location (based on OICA)**Figure 9** Ford production location (based on OICA)

Figures 8 and 9 show that the US manufacturers do not have the same emphasis on their home country as the Japanese manufacturers have on Japan. Both the manufacturers produce approximately 30% of their cars in the USA. Similar to Japanese companies, the US manufacturers produce many cars in West Europe.

General Motors has decreased production in West Europe and the USA while it increased production in Asia-Oceania and South America, which illustrates a shift in production from high labour cost countries to low labour cost countries. Ford has decreased production in the USA as well but increased production in West Europe. Furthermore, Ford did not significantly increase production in all low labour cost regions. For example, production in Mexico declined and the growth in Asia-Oceania or South America was much smaller than for General Motors.

Table 6 gives the production quantities of these two manufacturers for West Europe and the NAFTA region.

Table 6 Share of US producers in West Europe and NAFTA (based on OICA)

	1998 (%)	1999 (%)	2000 (%)	2001 (%)	2002 (%)	2003 (%)	2004 (%)
General motors	90.1	90.8	88.7	85.1	81.6	80.5	76.2
Ford	91.5	91.7	92.4	93.8	92.6	91.1	88.2

Table 6 gives that Ford has remained largely concentrated in West Europe and NAFTA with almost 90% of its passenger car manufacturing in these areas. General Motors has reduced its emphasis but is still producing more than 75% of its cars in these regions.

Next, we look at the growth in the Asia-Oceania and South America regions for General Motors to determine in which countries growth occurred. General Motor's production in Asia-Oceania increased from 120,406 in 1998 to 362,016 in 2004 and in South America from 356,164 in 1998 to 537,166 in 2004, respectively. As with the Japanese producers, this increase is mostly due to only a few selected countries; China in Asia-Oceania and Brazil in South America. Table 7 illustrates production figures from 1998 and 2004 which shows that China accounted for an increase of 191,327 cars in Asia-Oceania or almost 80% of GM's production increase in Asia-Oceania. Production in Brazil increased with 156,389 units which accounts for over 85% of GM's production increase in South America.

Table 7 GM's production increases in Asia-Oceania (based on OICA)

GM	Asia-Oceania (total)	China	South America (total)	Brazil
1998	120,406	0	356,164	326,884
2004	362,016	191,327	537,166	483,273
Increase	241,610	191,327	181,002	156,389

Conclusion: Overall, the situation for US manufacturers is less clear than that of the Japanese manufacturers. On the one hand, it is not observed that Ford is moving production to low labour cost countries; it decreased production in the USA but it increased production in West Europe and simultaneous increases in low labour cost countries were small. General Motors appears to be relocating production from high labour cost countries to low labour cost countries, particularly located in Asia-Oceania and South America. In this instance, similar to the Japanese manufacturers, most of this production shift occurs to a limited number of countries. Nevertheless, West Europe and NAFTA remain important production locations for the two US manufacturers.

Surprisingly, both manufacturers have decreased their production in Mexico. It must also be noted that both General Motors and Ford have witnessed a decline in their absolute total world car production figures. This decline is not representative for the non-US manufacturers, which is evident since total world production has increased. Therefore, in particular US-oriented media may be oriented towards 'accusing' for example China of stealing jobs. The data above shows that US manufacturers may be dealing with an uncompetitive situation which is not caused by labour wages per se since at the same time for example, the Japanese companies have increased their production in the USA.

3.3.3 West European producers

The production quantities of five West European car manufacturers are shown in Figures 10–14.

Figure 10 VW production location (based on OICA)

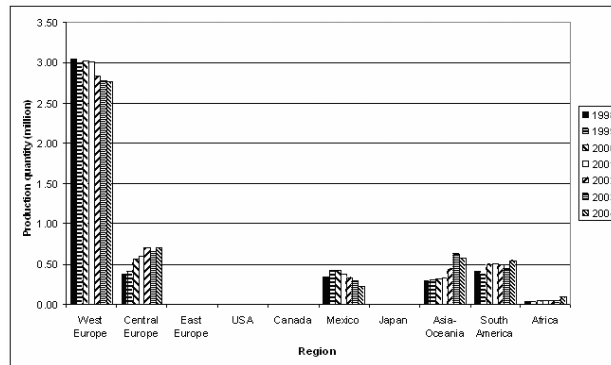


Figure 11 Daimler production location (based on OICA)

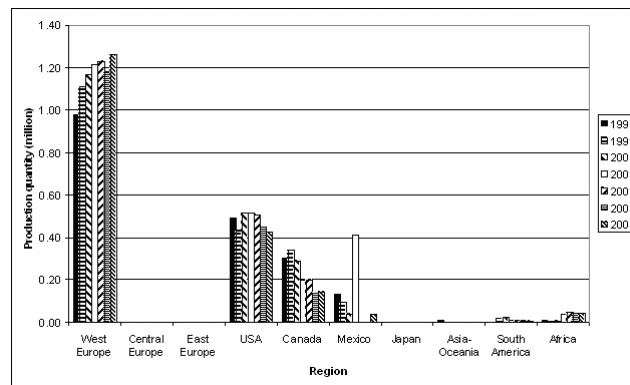


Figure 12 PSA production location (based on OICA)

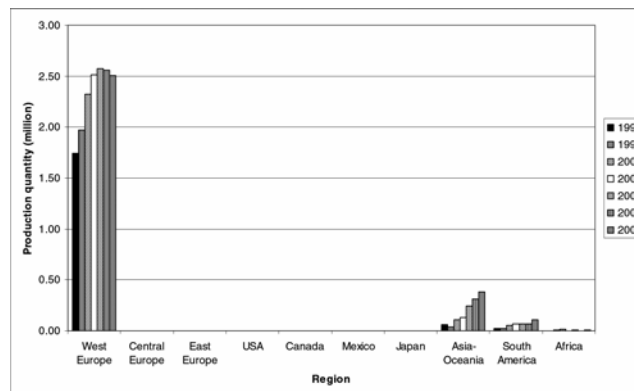
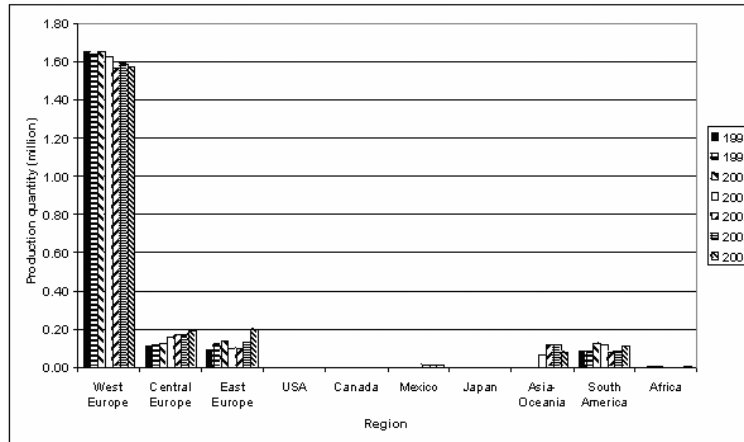
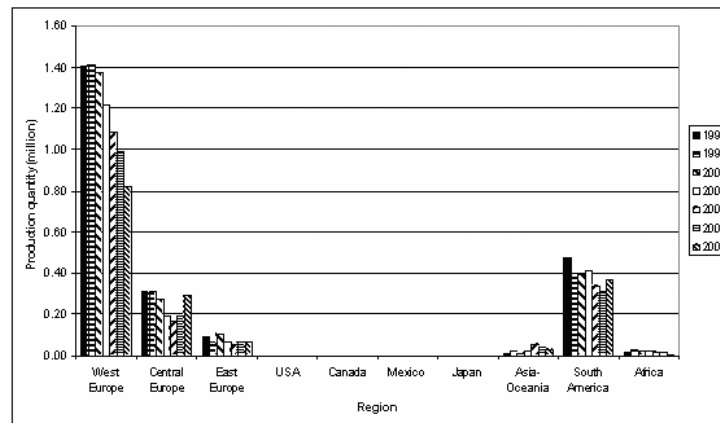


Figure 13 Renault production location (based on OICA)**Figure 14** Fiat production location (based on OICA)

Figures 10–14 illustrate that West European car manufacturers emphasise West European production. Their emphasis is even stronger on their home region than the Japanese emphasis on Japan. Japanese manufacturers produce approximately 50% of their cars in Japan. The West European manufacturers produce over 50% of their cars in West Europe. Fiat, Volkswagen and Daimler are at the low-end with, 51%, 56% and 65%, respectively of West European production in 2004. Renault has approximately 75% of production in West Europe and PSA almost 85%. It is also worthwhile to mention that West European car manufacturers produce hardly any cars in the USA.

Volkswagen shows signs that it has shifted production from high labour cost countries, that is, West Europe, to low labour cost countries, that is, Central-Europe, Asia-Oceania, South America and Africa. Renault shows a similar pattern. However, Volkswagen also shows a decline in production in Mexico and for Renault production in South America remained relatively stable from 1998 to 2004.

Fiat has witnessed a large decline of production in West Europe but simultaneously a (small) decline also occurred in low labour cost regions such as Central-Europe, East-Europe and South America. Nevertheless, for Fiat, there also seems to have been a shift from high labour cost countries to low labour cost countries since the reduction in high labour cost countries was quite large (i.e. absolute numbers), leading to a shift in emphasis (relative importance of high labour cost regions).

PSA and Daimler do not confirm this pattern. Both have increased production in a high labour cost region, that is, West Europe. PSA also has increased production in Asia-Oceania and South America but this increase was less than in West Europe. Daimler had a very small increase in Africa but also decreased production in other low labour cost regions such as Mexico and Asia-Oceania as well as in high labour cost countries such as the USA and Canada.

The European producers have a heavy emphasis on West- and Central-Europe as can be seen in Table 8.

Table 8 Share of West European producers in Europe (based on OICA)

	1998	1999	2000	2001	2002	2003	2004
Volkswagen	76.0	75.0	73.7	74.0	73.0	70.8	70.8
Renault	95.6	95.8	93.6	90.8	89.7	89.5	90.6
Fiat	78.4	80.2	80.2	76.1	75.8	77.1	74.3
PSA (only West Europe)	95.2	96.4	93.0	92.8	89.0	87.2	83.5
Daimler (only West Europe)	50.7	55.6	57.0	50.8	61.0	64.9	65.7

Next, we will look at the growth in Asia-Oceania for Volkswagen, PSA, Renault and Fiat. Table 9 gives the total production in Asia-Oceania in 1998 and 2004 and some of the differences in countries.

Table 9 Production of West European producers in Asia-Oceania (based on OICA)

<i>Combined</i>	<i>Asia-Oceania (total)</i>	<i>China</i>			<i>Iran (PSA)</i>	<i>South-Korea (Renault)</i>
		<i>VW</i>	<i>PSA</i>	<i>Fiat</i>		
1998	361,985	295,118	39,341	0	0	0
2004	1,069,677	575,546	73,804	23,911	308,592	80,906
Increase	707,692	280,428	34,463	23,911	308,592	80,906

Table 9 illustrates that, similar to the Japanese and US manufacturers, the increasing production in Asia-Oceania is specific to a few countries. For West European manufacturers, these countries are China, Iran and South-Korea.

Conclusion: Overall, it cannot be generalised that the European producers are moving car production from high labour cost regions to low labour cost regions. Although some of the European producers show evidence for this pattern, that is, simultaneous increase in production in low labour cost countries with a decrease in high labour cost countries, other European manufacturers do not show this pattern.

With regard to growth in low labour cost regions, this growth is, similar to what was found for the Japanese and the USA producers, limited to a small number of countries.

4 Discussion

In this paper, a data-driven analysis was conducted on the location of passenger car manufacturing to investigate whether trends appear that car production is relocating from high labour cost countries to low labour cost countries in an absolute sense. We did not simply look at shifts in relative importance, that is, production shares. In a relative sense high labour cost countries are becoming less important due to growth of production in several low labour cost countries. However, we were interested in whether production decreases in high labour cost countries could be connected with increases in production in low labour cost countries.

The data of the passenger car manufacturing industry show that relatively speaking the high labour cost countries are becoming less important (see Figure 1) due to production growth in several low labour cost areas. However, the data do not provide evidence that car manufacturing activities are in general relocated from developed (high labour cost) countries to developing (low labour cost) countries in absolute numbers. That is, there is no persistent trend (at either the regional or country level) where production is reduced in high labour cost countries while it is simultaneously increased in low labour cost countries. Production growth is certainly occurring in low labour cost regions but it cannot be concluded that this is at the expense of high labour cost regions. However, at the country level, the USA showed significantly declining production figures.

At the company level, the Japanese manufacturers have been and remain focussed on Japan, West Europe and the USA. Although they increased production in Asia-Oceania, particularly in China and Thailand, this is not connected with decreasing production in the high labour cost regions. The US manufacturers show an inconsistent picture. Ford did not follow a strategy to focus more on low labour cost regions while General Motors did. Both General Motors and Ford had declining production in the year 1999 and 2000, respectively. Both companies remain heavily focussed on NAFTA and West Europe.

The European manufacturers also show a fragmented picture. Volkswagen and Renault seem to have moved some of their production from high labour cost regions to low labour cost regions but this cannot be concluded for PSA and Daimler. Instead, in particular PSA has focussed more on West Europe.

The media attention mentioned earlier in this paper where statements are made about the loss of US manufacturing to countries like China may have been caused by the fact that car manufacturing has declined in absolute numbers in the USA and that both US manufacturers (GM and Ford) decreased absolute production in the USA. Nevertheless, this is not a general finding for high labour cost countries. The data also do not show a conclusive connection between lowering production in the USA and simultaneously increasing production in China. For example, Ford also increased production in West Europe.

When looking at the production increases in low labour cost regions, these increases occur in a limited number of countries indicating that it might not be simply cost reasons alone that motivate companies to locate to these countries, otherwise a more widespread pattern of production among many low labour cost countries would be expected or even a concentration on the lowest labour cost countries. Rather, there may be other influencing factors such as for example proximity to market which was another important factor mentioned by Ferdows (1997b). Proximity to market may offer explanations for this industry due to transportation costs and tariffs, etc. which may make

it attractive for companies to produce close to where the market demand is occurring. This potentially explains why some low labour cost regions have seen increased production while this has not necessarily been at the expense of the high labour cost regions. There are empirical observations that support this notion. For example, car manufacturing companies are establishing production capacity in China to meet the growing Chinese demand for passenger cars (McGregor, 2003a–c). Another example is Volkswagen which is reducing production in Brazil due to lagging Brazilian demand (Mackintosh and Colitt, 2003) and in Mexico due to slow sales (Harnischfeger, 2003). Yet another example is Ford which increased European production due to increased European demand (Scheer and Moes, 2003). If this relationship exists (and is valid for other industries as well), it means that in the current situation for this type of products industrially advanced nations are not losing their industrial base as long as there is a national/regional demand for the products produced with this national industrial base.

Finally, the lack of a pattern that shows an absolute decline in production in high labour cost countries with a simultaneous increase in production in low labour cost countries may also illustrate that production costs are not necessarily less in low labour cost countries. Markides and Berg (1988) argued that moving production to low labour cost countries was not necessarily good for all companies. One point they made over 15 years ago is that while many US companies argued that this was their only option to stay competitive this was considered invalid by Markides and Berg (1988) and for example proven to be invalid by the ability of Japanese companies to produce in the USA. Our analysis shows a similar pattern where GM and Ford have decreased production in the USA while Japanese companies have increased their production in the USA. This may indicate that there are competitiveness issues with GM and Ford in particular, not with the overall manufacturing competitiveness of the USA. Another indication about the ‘true’ competitiveness of low labour cost countries comes from a recent statement on international cost comparisons. It was recently stated that the vehicle manufacturing cost in China are among the highest in the world. According to General Motors to produce cars in China costs 20–30% more than to produce them in the USA (Mackintosh and McGregor, 2003).

5 Conclusion

In this paper, a data-driven analysis was conducted on the location of passenger car manufacturing to investigate whether trends appear that car production is relocating from high labour cost countries to low labour cost countries in an absolute sense. We did not simply look at shifts in relative importance, that is, production shares. In a relative sense high labour cost countries are becoming less important due to growth of production in several low labour cost countries. However, we were interested in whether production decreases in high labour cost countries could be connected with increases in production in low labour cost countries.

At each level of analysis, that is, regional level, country level and manufacturer level, no conclusive or generalisable evidence was found for such a trend in this industry. Generally speaking, although car production has increased in Asia-Oceania, specifically in a few countries such as China and Thailand, this increase has not been at the expense of high labour cost countries. Therefore, one should be cautious about claims that high labour cost countries are losing production to low labour cost countries. If such a phenomenon exists, it may be dependent on the type of industry.

Nevertheless, there is growth of production in low labour cost countries but as pointed out this is not connected with decreasing production in high labour cost countries. It is possible that this growth is in addition to existing production quantities and is located in low labour cost countries due to local demand. In car production, the location of production might be related to the location of the market due to transportation costs and/or tariffs. Further studies in passenger car production are required to verify whether car production takes place near the market. Insight into this issue can be gained from examining export and import figures. Furthermore, an examination of trade figures may provide insight into possible trends. For example, it is possible that currently much production in developing countries is aimed at regional markets with limited export to industrialised countries but that trend is increasing.

Other analyses can be conducted at the level of car component manufacturers to see whether upstream supply chain activities are being transferred to low labour cost countries. If the trend for automotive component manufacturers is similar to the findings for passenger car producers, for example, a large part of the location is determined by demand, then it is expected that car component manufacturers are located in similar locations as the passenger car producers. This may also show that the location of car manufacturers and car component manufacturers are correlated. Analysing other industries will provide further insights for generalising and verification purposes.

A final suggestion for further research is to look at the specific situation for the USA. The analyses show that the USA has decreasing passenger car production figures and in particular US producers are decreasing their production in the USA. Insight into the causes for these phenomena and contrasting them with the situation in Japan and Europe may lead to important insights on how industrialised countries can remain competitive.

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