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Master Thesis

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# Reshoring Manufacturing

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## **Preface**

This Thesis is the final part of my education as a Superior Industrial Engineer specialized in Management at ETSEIB, Barcelona. It has been conducted in the spring of 2015 at the Faculty of Engineering at Lund University during my 1-year stay as an exchange student.

I would like to give a special thanks to my supervisor, Jan Olhager, who gave me the opportunity to write my thesis about such an interesting topic. Jan has guided and has helped me throughout the entire semester with greatly valuable comments and suggestions that I very much appreciate.

I would also like to thank Andreas Agnesson, the foundry manager of the manufacturing plant of Xylem in Emmaboda, for agreeing to be interviewed and kindly show Jan and me the factory in a guided tour of their installations.

Finally, I would also like to thank my family for their support.

Lund, June 2015

Pau Alkain Adroer

## **Abstract**

Title: Reshoring Manufacturing

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Background: Since the last decades of the twentieth century there have been lots of companies who had moved their production processes from the origin country to another different country because of a lower cost of operations in the new location. These better conditions were due to fewer labor costs, fewer land prices, fewer transport costs and lower taxes, among others. However, nowadays reshoring is receiving increasing attention, as these conditions already mentioned are not as good as they used to be, specially the labor costs in China. Thus, there are more and more companies who contemplate the idea of bringing manufacturing back home.

Purpose: The goal of the thesis is to analyze the different factors that have to be considered when bringing manufacturing back home. Are we in front of a western manufacturing renaissance?

Method: This Master Thesis is divided into two parts. The first one is a study of the different literature available referred to reshoring and the manufacturing location decision. The second part is the Case Study of the company Xylem. The investment in a Swedish company is considered, trying to link what has been analyzed between theory and practice.

Delimitations: The literature about reshoring is limited nowadays because the phenomenon is quite recent.

Conclusion: The conclusions of this Master Thesis are divided into three parts. The first conclusion is that the manufacturing location decision has to be analyzed in depth, taking into account both the production costs as well as hidden costs. The second conclusion is that not every industrial sector will reshore, nor in the same way and to the same extent. Finally, propositions for future research are thoroughly commented.

Keywords: Reshoring, offshoring, outsourcing, insourcing, manufacturing location decision.

## **Abbreviations**

TCE	Transaction Cost Economics
RBV	Resource-Based View
SCM	Supply Chain Management
VMI	Vendor Management Inventory
CPFR	Collaborative Planning, Forecasting and Replenishment
PLC	Product Life Cycle
CSR	Corporate Social Responsibility

## **1. Introduction**

*In this chapter the background, purpose and organization of the thesis is presented as follows.*

### **1.1. Background**

Since the last decades of the twentieth century there have been lots of companies who had moved their production processes from their origin country to another different country (offshore) where labor, engineering, and managerial costs were significantly lower. At the end of the twentieth century, many firms were moving at least some of their operations to East, Southeast, and South Asia (Tate et al, 2014). Then, companies of all sizes and sectors decided to produce outside, seeking greater profit margins or the need to adjust costs to be more competitive in a global market prices obsessed with low costs. These emerging countries offered indeed good conditions principally because of:

- Lower labor costs.
- Lower land prices.
- Lower taxes.
- Poor labor rights and lower environmental protection.
- Low transport costs.

However, nowadays reshoring is receiving increasing attention, as these conditions already mentioned are not as good as they used to be, specially the labor costs in China. The Boston Consulting Group (BCG, 2012) argues that by sometime around 2015 manufacturing in North America will be as economical as manufacturing in China for many goods destined for North American customers. Thus, there are more and more companies that contemplate the idea of bringing their manufacturing back to their country, or at least some of it.

Reshoring would bring work opportunities back to the US and Europe, with more stimulating jobs than before as the manufacturing plants will be more automated and the workers will have more responsibility (Ford, 2014). However, this also means that probably less people will be required in the new country home location.

This phenomenon is more important in the US but it is gaining strength in Europe, especially in Germany due to its big industry. France and the UK are following the same pattern to a lesser extent, while in Spain there is not a lot of evidence about reshoring. This is because they had less incentive to offshore as the labor costs were already low some decades ago (Leibl et al, 2011). However, in one of the most industrialized parts of the country, Catalonia, there was once a powerful textile industry, which in the future could have the potential to grow back as part of the economy.

## **1.2. Purpose**

The main purpose of the Thesis is to analyze the reshoring phenomenon and the factors that make companies relocate their manufacturing back home in the western countries. After analyzing them, the key research question will be if we are in front of a western manufacturing renaissance. Moreover, the purpose of the Case Study is to contrast the theoretical framework with a real case and evaluate possible common points.

## **1.3. Organization of the thesis**

The paper is divided into six chapters.

*The first chapter* presents the background, the purpose and the organization of the Thesis.

*The second chapter* consists on the methodology and delimitation of the thesis, and it covers the literature review and the case study.

*The third chapter* includes an introduction to the different concepts and the history of manufacturing location decision.

*The fourth chapter* presents the theoretical framework, emphasizing the influencing factors on strategic reshoring decisions.

*The fifth chapter* consists on the case study of the company Xylem.

*The sixth and last chapter* presents the conclusions and the suggestions for future improvement and future study.

## **2. Methodology and Delimitations**

*The main focus of the Thesis is on the literature review, adding a practical perspective through a Case Study. The Case Study will add a real-life example after having carefully revised the theoretical framework.*

### **2.1. Literature Review**

The purpose of this part of the thesis is to try to thoroughly revise and connect all the different theoretical literature about the manufacturing location decision and specially about reshoring. The literature review is the introduction of the Thesis, and it must:

- Be organized and directly related to the topic of the Thesis
- Analyze possible areas of controversy in the literature
- Build an understanding of theoretical concepts and terminology
- Incorporate conclusions into a summary
- Analyze and interpret results

Literature reviews are also important for identifying possible future research areas and contribute to the knowledge of the field. In this case, the literature review of the Thesis can be divided into three parts.

The first part of the analysis is an introductory part, where the different sourcing options and some historical manufacturing location decisions are explained. This is the preparatory part, to better understand what is going to be further on studied. Moving forward, the second part of the literature review is the most important of the Thesis. It starts with a general section, where some industrial location theories are explained chronologically and supply chain factors on multinational location decisions are explored. The general section follows with how industrial commons or clusters in the Western world are affected by offshoring and with a new approach to the PLC model. Then, the author starts to deeply analyze the reshoring trend. First, the author introduces why reshoring is attractive to put the reader into context. The main part of the Thesis follows after this introduction, analyzing the different factors driving the manufacturing location decision, with an emphasis on how they specifically affect reshoring. After having analyzed the different factors, some other reshoring issues are studied, such as the potential of reshoring in Europe, American reshoring cases, the complexity of reshoring in practice and human and environmental rights. Finally, the last part of the literature review is the summary, where the author tries to compile and summarize what has been studied before.

## **2.2. Case study**

This is the 'field work' part of the paper that studies the investment made by the company Xylem in its manufacturing plant. A case study can have a strategic importance in relation to the general problem, as it can help understanding the theoretical framework. Then, a case study is used to help the reader see the complexities of real life decisions. Analyzing a case study requires applying the knowledge and skills learned previously to a real situation. So, a case study must:

- Be taken from a real situation
- Consist of many discussed parts
- Include sufficient information and be correctly linked to the theory
- Be believable for the reader

In this case, an interview regarding the reshoring trend and the specific investment of Xylem was done in order to put the theoretical framework into practice. The case studied is not exactly about reshoring, because the company did not bring manufacturing back home. However, it can be perfectly connected as the company decided to strengthen its Swedish plant with an important investment rather than move abroad, taking into account several factors studied in the theoretical framework.

## **2.3. Delimitations**

As reshoring is a quite recent trend, the literature on the issue is not abundant in Europe. However, there are several articles regarding reshoring in the US and some regarding the Western countries in general.



### **3. Concepts and history**

*First of all, the different sourcing options and the manufacturing location history are exposed. The purpose of this chapter is to understand the different sourcing concepts to be able to differentiate them, as well as have an idea of the evolution of the manufacturing location decision in the last decades.*

#### **3.1. Concepts**

Companies continually seek ways to grow or at least maintain their competitiveness. Sourcing decisions are in the heart of this evaluation. Thus, to be able to understand the manufacturing location decision, the definitions of offshoring, reshoring, insourcing and outsourcing have to be presented first. Besides, to comprehend the factors leading the decision of reshoring it is important to know which were the previous factors for offshoring.

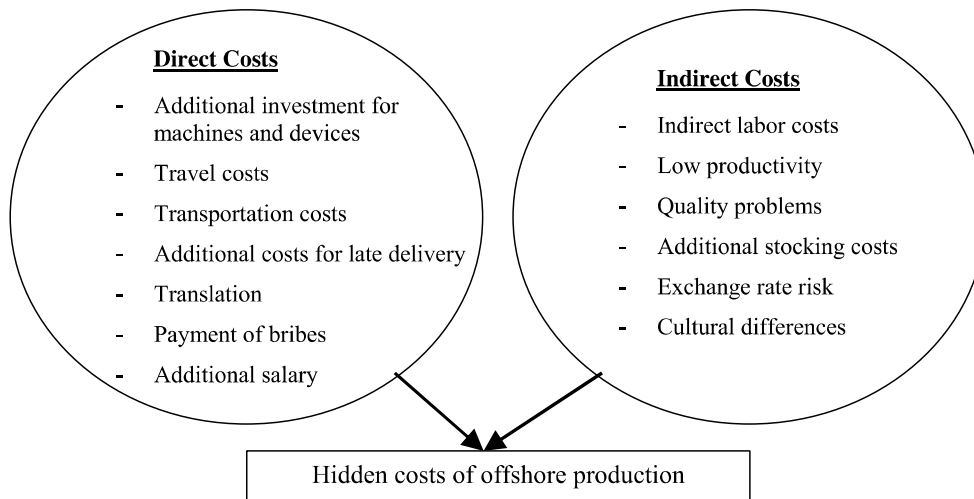
##### **3.1.1. Offshoring**

Offshoring is the relocation by companies of either production plants or services from an origin-developed country to a less industrialized or developing country. Companies relocate their activities because they look for lower costs of operations in the new location, with a focus on the labor costs. So, some decades ago it seemed to make no sense not to offshore as the labor costs in some developing countries were extremely lower (Hutzel and Lippert, 2014).

There exist two different ways to do offshoring depending on whether the company wants to maintain the production in-house or contract another company to provide them. The first way to do it would be offshore insourcing, meaning that the production of the company is situated in a foreign country (far away from the firm's home region) but it is still kept to itself. On the other hand, offshore outsourcing means that the production is also located in a foreign country but it is subcontracted to an external vendor (Gray et al, 2013).

Apparently, offshoring might be beneficial as it creates jobs in a developing country and, consequently, the lost jobs in the origin country can become more competent. However, this might be true in economic good times but not after a global crisis when the destruction of jobs is more likely.

Many companies took offshoring as the better solution to reduce costs. The problem is that some of them decided to offshore without a detailed risk study of the situation. There are hidden costs that were not considered at the beginning that can make the decision completely profitless. The Figure 1 illustrates these hidden costs.



Source: Schulte, A. (2002): Das Phänomen der Rückverlagerung. Internationale Standortentscheidungen kleiner und mittlerer Unternehmen. Wiesbaden: Gabler.

*Figure 1. Hidden costs of offshore production (Leibl et al, 2011)*

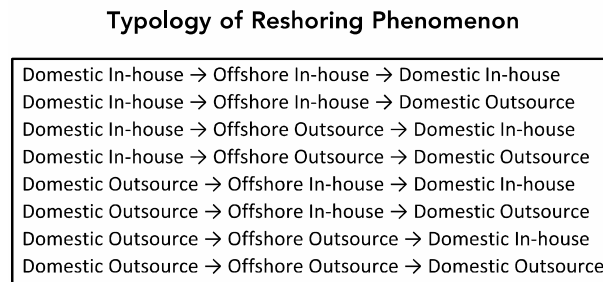
In addition to that, the term *nearshoring* means exactly the same as offshoring but with the difference that the location of the manufacturing plant is within the company's region (e.g. An Italian company locates its production activity in Romania). The main advantages of nearshoring are the lower distance between the headquarters and the nearshored plant and the better production control obtained (Frattochi et al, 2014).

So, after having detected these hidden costs, reshoring has been receiving increasing attention from many western countries.

### **3.1.2. Reshoring**

Also known as inshoring, backshoring or even back-reshoring, reshoring is a location decision to bring manufacturing back home from a current location into the country of origin (Europe and USA) (Gray et al, 2013). So, by definition, a company can just reshore their manufacturing if it has previously offshored. Hence, companies are increasingly realizing that costs and risks previously ignored are large enough to overcome the wage differential in other countries. The benefits of producing close to the western market are starting to be seen (Ford, 2014). Thus, the economic downturn, an increasing emphasis on sustainability and flexibility has led firms to reconsider the offshoring decision according to (Tate et al, 2014). As Van den Bossche et al (2014) argues, a number of macroeconomic factors have tipped the balance of reshoring in its favor. Some examples are the appreciation of China's currency versus western countries, the wages in China, low energy costs in the US, supply chain problems and a general push or even incentives from the governments to bring manufacturing back home. But there are also other qualitative aspects such as product quality or flexibility that are similarly starting to concern the offshored companies.

In consequence, nowadays there are more and more manufacturing companies in the US and Europe that are considering bringing jobs back from Asia. The different reshoring possibilities are shown below in Figure 2.



*Figure 2. Typology of reshoring phenomenon (Gray et al, 2013)*

### **3.1.3. Insourcing**

In terms of sourcing, a company has to decide whether if it wants to produce in-house or subcontract another company.

Insourcing is the performing of tasks or functions in-house within the company. Therefore, it is a decision often made to gain control over production and improve cost effectiveness, not being dependent on a third party force. A company may decide to insource with the search for cost reduction or just to improve their production processes.

This strategy seeks to use internal resources within the organization to be more competitive. Thereby, insourcing will look for talented people inside the company to develop their activity in the most efficient way. However, sometimes it is not possible to insource for some reason and there is a need to outsource.

### **3.1.4. Outsourcing**

Outsourcing is the process of contracting a business function to an external company. However, hiring the services of an external company is no necessarily outsourcing. This external company will be given administrative and operational control by the contracting company for the specific business function, so it would involve a considerable degree of two-way exchange of information, coordination and confidence. Outsourcing is characterized by non intrinsic specialization to the core of the company.

The overall service costs can be lower if they are outsourced, allowing many companies to close some of their departments (e.g. customer service) and outsource them to third parties. Outsourcing can be either inside the country or outside it. According to (Dossani and Kenney, 2007) the offshore outsourcing phenomenon gained importance and attention

in theory and practice some years ago (Tate et al, 2009). The logical consequence of this decision was to outsource in countries with lower labor costs (offshore outsourcing), motivated by a combination of environmental pressure, efficiency, and competitive pressure (Tate et al, 2009).

The drivers of the offshore outsourcing decision can be analyzed by transaction cost economics (TCE), see Figure 3. If firms that offshore outsource services perceive the new market more efficient, offshore outsourcing is expected to grow. Moreover, a resource-based view (RBV) perspective considers whether certain resources or capabilities contribute to a firm's competitive advantage, so, in the case they do, offshore outsourcing is also expected to proliferate (Tate et al, 2009).

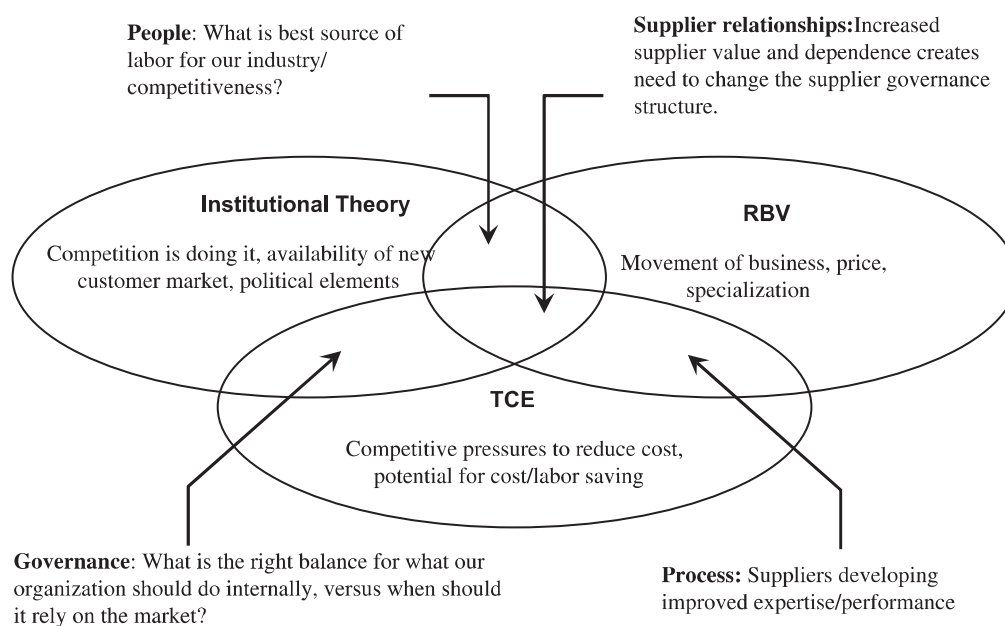


Figure 3. Drivers of offshore outsourcing (Tate et al, 2009)

After having examined the different sourcing possibilities, Table 1 and Figure 4 summarize the different alternative manufacturing locations and the relation between them.

		Manufacturing Location	
		Home -> Abroad	Abroad -> Home
Production	From out to in	Offshoring insourcing	Reshoring insourcing
	From in to out	Offshoring outsourcing	Reshoring outsourcing

Table 1. Manufacturing location VS Production

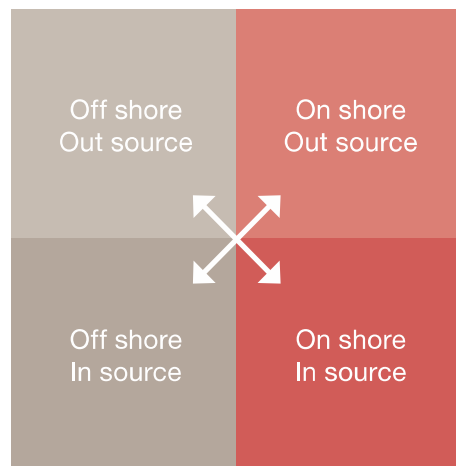


Figure 4. “In/Out house” VS “In/Out country” (PWC, 2013)

### 3.2. History of the manufacturing location decision

International trade has existed ever since the start of the civilization. Every region has always had its specific advantage when coming to make or produce a certain good, so they could have been swapping with other regions that produce other goods. These advantages used to be of natural condition, e.g. the production of a specific fruit needs a particular climate and land, which some regions have and others simply don’t (Hutzel and Lippert, 2014).

Nowadays, however, there are other advantages to consider (when producing goods that don’t need a specific natural environment) such as labor costs. In the last decades it has been really frequent for companies to locate their production in to low labor cost countries, especially China. Thereafter, these companies have been producing their goods in another country and then bringing them back to the origin country, even though having to ship them for long distances.

As new technologies have been improving the way goods are transported, making communications easier and faster, international trade has thrived until reaching a completely global market. In the last century, transoceanic shipping became more accessible and faster due to the naval engineering improvements and international communications in real time helped when considering producing in another country (Hutzel and Lippert, 2014).

Still, some of these companies probably didn’t think long-term on what was going to happen if the wages of these developing countries were about to rise in the next decades. The world is in constant change and every possible hypothesis has to be considered, even more when it is so strategic. In the next graph of a study made by the consultancy company BCG, one might observe that the Chinese wages have been growing fast and the trend was that they are going to continue along the same line, see Figure 5 (BCG, 2011).

### EXHIBIT 1 | China's Wage Rates Are Growing Rapidly

Average wages could approach 17 percent of those in the U.S. by 2015, up from 3 percent in 2000

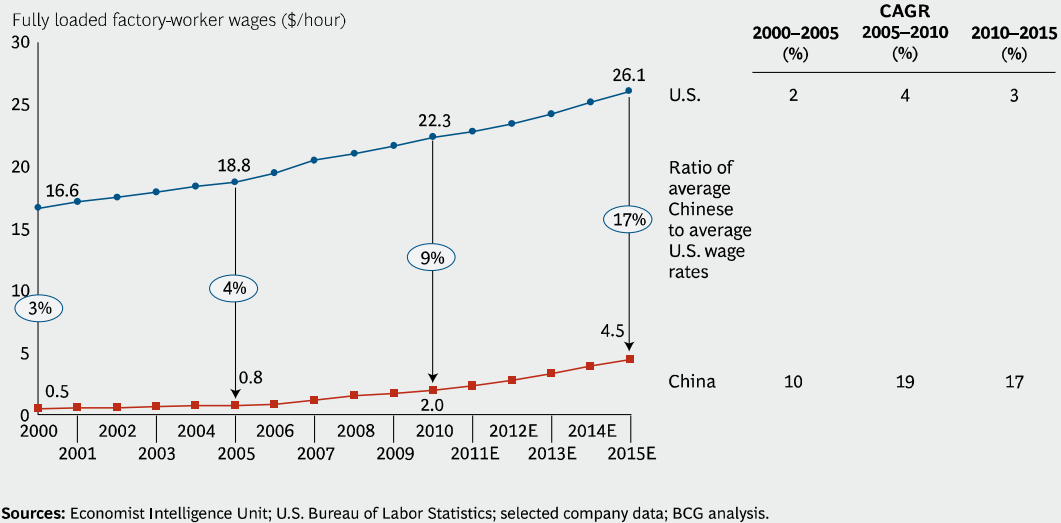


Figure 5. Wage rates evolution (BCG, 2011)

This pattern is making some companies reconsider their offshoring decisions. Although the biggest factor for this change might be probably labor costs, there are other important factors to consider such as increases in land prices, environmental and safety regulations and taxes.

In any case, (Ford, 2014) argues that the significance of the labor cost differential is not as important as many people think. The manufacturing costs are around 20% of the product price, and an 80% of that cost is for materials. That leads to a 4% cost of manufacturing operation, which can be separated into cost of machinery, operational overheads, labor and profit margin. Nevertheless, on the other hand, (BCG, 2011) affirms that the labor cost accounts for 20% of the total product cost. Anyway, it is obviously an important aspect to consider.

In addition, China has created some good clusters with reliable supply chain structures and their internal demand has been spreading a lot since the consumers have now better purchase power than some years ago. As earlier pointed out, wages have been increasing a lot from year to year but so has productivity (The economist, 2012). That is probably the reason why so many companies are still located there.

Nevertheless, a new reshoring trend has also emerged in the last few years as a necessity to bring jobs back home. The global crisis has had a huge impact in all the developed countries and they are all now growing certainly slow. Companies are waking up to the fact that the pros of offshoring are no longer what they were once (Ford, 2014).

Anyway, trends tend to be cyclical and are spurred by changes in market conditions. On account of this, no one can exactly predict what is going to occur in years to come.

## **4. Theoretical framework**

*In this chapter the theoretical framework is presented, with a special emphasis on the influencing factors that companies should consider for bringing manufacturing back home. But first, some other aspects are presented, with a general view of the manufacturing location decision. Finally, some other reshoring topics are examined.*

### **4.1. General**

#### **4.1.1. Industrial location theories**

The term industrial location refers to studies and decisions on which is the best place to establish an industry or factory. Thus, the location of industries throughout the territory is not due to a coincidence, but mainly a business decision based on criteria of economic efficiency, i.e. ensuring maximum benefits and minimum industrial production costs. Thereby, location theories deal with which is the optimum location for a company economically speaking.

Both physical and human factors come into play when deciding the most suitable industrial location, such as:

- Proximity to raw materials and energetic sources.
- Topography.
- Cheap, skilled, and abundant labor.
- Proximity to demand.
- Supply chain structure.
- Political aspects.
- Industrial commons.

### **Von Thünen's theory**

Johan Heinrich von Thünen, a prominent nineteenth century economist, was the first to contribute to this topic in 1826 with his publication "The isolated state".

His idea is based on the assumption that man tries to meet their economic needs in the immediate environment, reducing their movements to a minimum. The theory is developed assuming an isotropic space (with the same geographical characteristics) and isolated, where the price of products varies with increasing distance to market. Although his theory was developed studying agriculture, its application in the industrial sector has also been useful.



Then, the industries with most demanded products would be located closer to the demand in order to look for lower transport costs.

### **Weber's theory**

Alfred Weber, a German economist, formulated a theory of industrial location in 1909. His general theory set down three necessary studies in order to reach the minimal cost involving both labor and transportation: the material index, labor, and agglomeration economics.

For his theory Weber supposes an isotropic space, but with resources located on a point and the market elsewhere. In general, the theory applies to heavy industry, but can be also applied to light industry. The key factor of the theory is the distance: the distance from the production plant to resources and markets. What is located is the production plant, which is the place of manufacture.

The choice of the location is determined by the location and interaction of different factors. The optimum location is based on the costs of transportation, the labor distortion (labor costs) and the agglomeration effect (concentration of firms in a relatively small area). Once these factors are analyzed, a firm can make a mathematical model over spatial geometry. This geometric space usually forms a triangle, where two vertexes represent sources needed to produce a good and the other the market. The plant is located, then, in the middle of the triangle, equidistant to all points. Thus, if production costs are the same everywhere, transportation costs will lead the choice of location. Then, with these assumptions, the optimum location of the plant will be the one where the transport costs are minimized.

However, the belief that nowadays transportation costs still play a major role when a company decides where to locate their production is doubtful, and firmly depends on the evolution of the oil prices and the supply and demand of transportation services (Holz, 2009).

Although this theory has many restrictions and has been widely criticized, it revolutionized this field and brought it to the academic stage.

### **Porter's model**

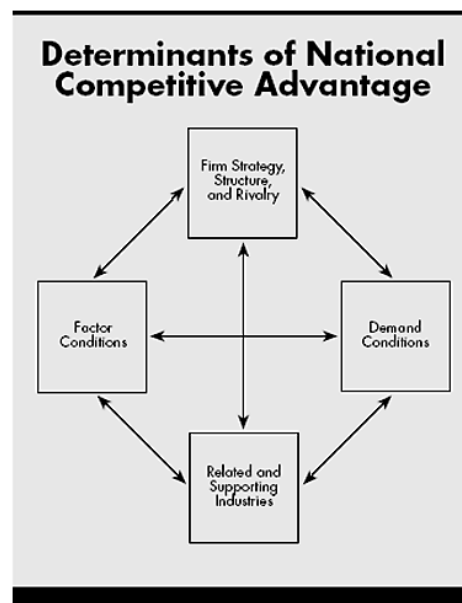
The Competitive Advantage of Nations, published by Porter in 1990, presents a new theory on how nations and regions interact, as well as their sources of economic prosperity. Therefore, Porter provides a good transition from traditional location theories (Porter, 1990).

*“A nation’s competitiveness depends on the capacity of its industry to innovate and upgrade. Companies gain advantage against the world’s best competitors because of pressure and challenge. They benefit from having strong domestic rivals, aggressive home-based suppliers, and demanding local customers.”*

Michael Porter updated the classical theory of Adam Smith's about nation's wealth, and the preponderance of the traditional factors of that wealth: land, natural resources and labor. In today's globalized and increasingly competitive economy, these factors cannot just explain by themselves the reasons why certain countries generate more wealth than others. The key is particularly competitiveness and productivity of nations and their industries in particular, which is expressed in various exports to different places and a solid investment outside their own borders.

A study of four years made in 10 nations examining patterns of competitive success in major countries concludes that companies achieve a competitive advantage through acts of innovation. As it is illustrated in Figure 6, the ability of a nation to innovate is affected by four broad features, the diamond national advantage:

1. Factor conditions.
2. Demand conditions.
3. Related and supporting industries.
4. Strategy, structure and rivalry of firms.



*Figure 6. Determinants of National Competitive Advantage (Porter, 1990)*

Based on this analysis, governments should act as catalysts and provocative, but should not become directly involved in the competition.

The author illustrates his argument with Italian shoe clusters, various Japanese industries with varying degrees of competitiveness and many more examples. The article is very forceful in discarding traditional explanations given to the competitiveness of a country: it has to do with the exchange rate, the cost of labor, with a positive trade balance with the level of government intervention or interest rates. Competitiveness is another thing and to properly address their challenges a very good leadership in both the private and the public sector is necessary.

However, the model does not sufficiently explain relocation tendencies, meaning that it does not explain what happens if companies want to locate their production outside the headquarter country.

#### **4.1.2. Multinational location decision: Supply chain factors**

Supply chain execution is influenced by various factors, but the one of the most important decisions faced by a company when thinking about this execution is deciding which is the best location of their plant. This decision has a determining effect on supply chain performance not just in quantitative aspects (transport costs, scale economies and other cost based variables) but also in lead-time, inventory, responsiveness to demand variability, flexibility and quality. So, supply chain competitiveness is impacted essentially by three important factors: location factors, supply chain uncertainty, and manufacturing practices (Bhatnagar and Sohal, 2005). This is illustrated below in Figure 7.

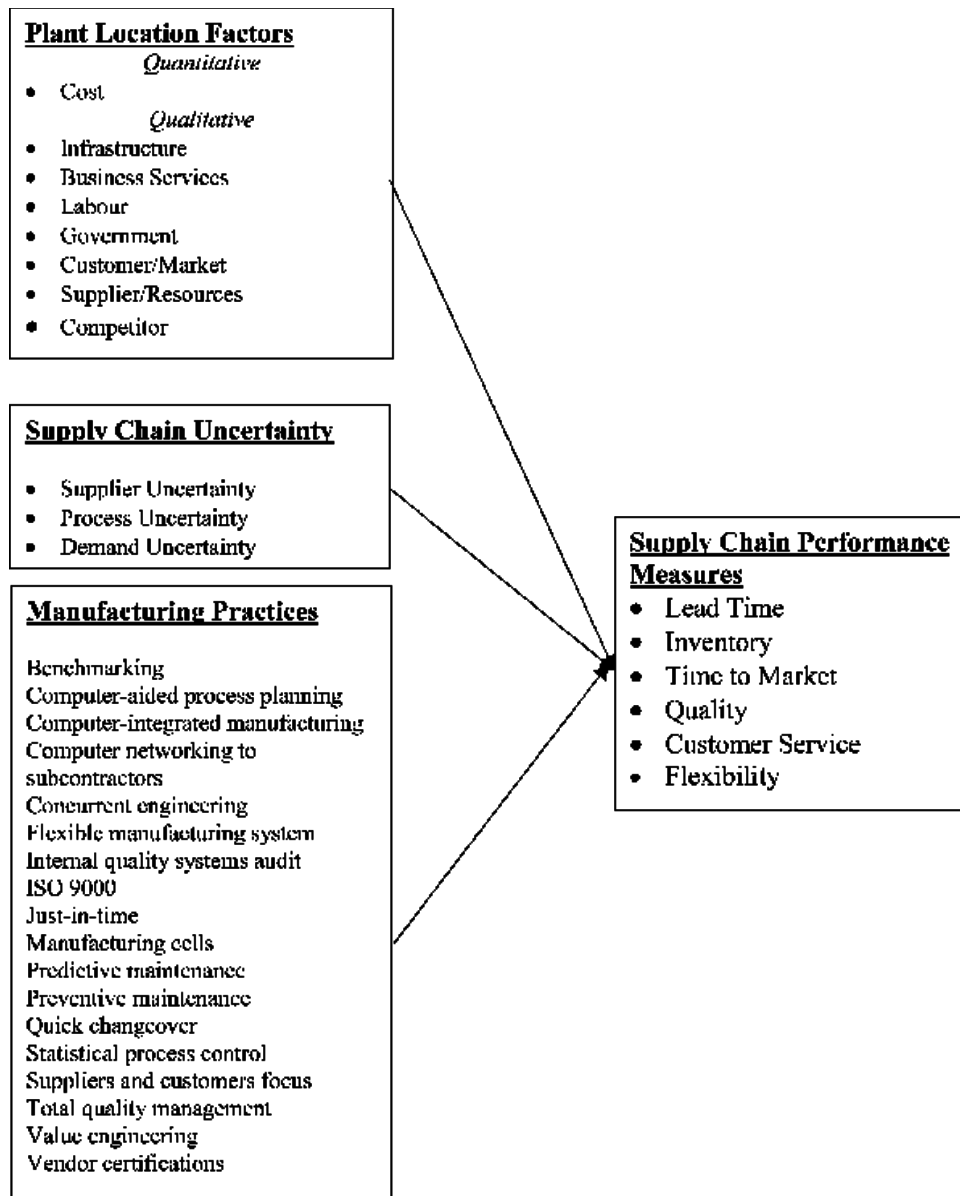


Figure 7. Supply chain competitiveness (Bhatnagar and Sohal, 2005)

To know the best possible location Supply Chain Management (SCM) can be used, a concept that first emerged 30 years ago. It is a cross-functional proposal that comprises managing the movement of raw materials into an organization, certain aspects of the internal processing of materials into finished goods, and the mobility of finished goods out of the organization and toward the end consumer.

However, the current SCM models no longer hold as they were conceived in a period of stability. We have been able to see crisis and shocks even preceding the global crisis, such as when we reached the infamous point of “peak oil” in 2008 (Cristopher, 2011). So, due to the last problems with logistics, the increasing primary factor costs and the decreasing export rebate programs, many companies are starting to reconsider their location decisions (Ellram, 2013).

The business world is inherently in constant change, so there exist a clear turbulence in supply chains. Thus, companies need a strategy that anticipates what is going to come, not that reacts after something bad has already happened. In order to deal with the constant changes in business, companies are in need of a dynamic point of view when designing their global supply chain (Arlbjorn and Mikkelsen, 2014).

To accomplish this they can use tools like Vendor Management Inventory (VMI), which improve the connection between buyers and vendors making it less likely to become out of stock and reducing inventory, or CPFR (Collaborative Planning, Forecasting and Replenishment) which seeks cooperative management of inventory through joint visibility and replenishment of products throughout the supply chain (Cristopher, 2011).

The agglomeration of manufacturing plants and their supply chains is what can create what is known as industrial commons.

#### **4.1.3. Industrial commons (clusters)**

Decades of outsourcing and offshoring manufacturing have had a huge impact in the US industry. The country has lost or is in process of losing the knowledge, skilled people, and supplier infrastructure needed to manufacture many of the contemporary products it invented (Pisano and Shih, 2009). Unfortunately, most domestic supplier networks have disappeared or followed their customers overseas (Van den Bossche et al, 2014).

“Nearly every US brand of laptop and cellphone is not only manufactured but designed in Asia”. There are managers that justify outsourcing decisions by saying that they can reverse them whenever they want if the situation is not as optimal as expected, but this reasoning ignores that this decisions not only affect the own firm but also their suppliers. These collective capabilities are called “industrial commons” (Pisano and Shih, 2009).

Then, the “industrial commons”, or clusters, are geographical concentrations of companies, institutions and agents related to a particular market, product or industry. This group creates a market concentration that provides competitive advantages.

Thus, positioning manufacturing close to an industrial common cuts down delivery times and reduces the inventory of goods. Moreover, the proximity also reduces the period of ordering cycles, letting companies respond more quickly to market changes. So, the actual process of reshoring is hard work, as this industrial commons in the US are weak and atrophied now (Shih, 2014). Proximity is crucial to exchange knowledge too. Engineers are more likely to exchange ideas if they live in the same region, as technical knowledge is more effectively transmitted face-to-face. Furthermore, some studies suggest that the main way

knowledge spreads is when people move from a company to another (Pisano and Shih, 2009).

Then, western governments need to reverse the situation if they want to return to the path of sustained growth. Rebuilding the industrial commons needs help both from the governments and the business. The political institutions have to contribute by providing more support to the educational system, encouraging advanced studies in engineering, and the companies need to carefully revise their previous outsourcing or offshoring decisions (Pisano and Shih, 2009). Thereupon, when a company offshores, it is not only affecting their own workers as they lose their jobs, but also is affecting their suppliers as they need to either move or even disappear. Therefore, the decision to offshore must include the awareness that it might be hard to reshore in the future as the home industry could be hardly damaged.

To better understand the cycle of the products related to the location of the manufacturing plants, the PLC model is presented.

#### **4.1.4. PLC model**

Raymon Vernon introduced the Product Life Cycle (PLC) model in 1966 (Vernon, 1966, 1979) according to (Tavassoli et al, 2013). The model describes the stages of a product from the launch until its obsolescence, proposing that the location of the production changes based on the maturity level of the product. Vernon (1996) argued that the expected life of a product is divided into the phases of product introduction, product growth, maturity, and decline, and so each phase has a different manufacturing location according to (Tavassoli et al, 2013). Then, the first production location (product introduction) would be in an advanced country (i.e. USA or Europe) due to the higher average income and demand in their market. Besides, in an advanced country there is more skilled labor and also effective communication with customers, suppliers and competitors. The new product would be introduced to meet local needs, but it could also be exported to similar countries.

At that time, if the product has survived its introduction phase, it will move on to the second state, growth. The second production location would be in other advanced countries. When demand increases and also does production, the focus is no longer on the characteristics of the product but on the production costs. This means that, even though there are still attempts for product differentiation, the company concentrates its efforts on product benefits. This is the best moment for any product because this phase is characterized by having a strong growth in sales and profits.

If the product still remains strong after the second period, the production would move to a lower cost location (less developed country) reaching the third phase. This is because in that

point the product has reached a standardized state, called maturity phase. The product is finally sold base on price, making the marketing costs lower as people already know it. Besides, there is no need of skilled labor as before because the product specifications are clear enough to manufacture more easily. Therefore, the company would try to find a location where the labor costs are going to be lower, but also bearing in mind that the transportation costs don't have to overpass this labor cost difference. At this stage, the company would have offshored and possibly outsourced their manufacturing.

The final phase in the PLC model is the product decline. Here, the product starts to diminish their sales because the market of the product will start to shrink. However, this last phase of the Vernon model can be modified nowadays observing the new reshoring trend. In addition, the recent changes and development in the less developed countries have to be considered, as one of the main problems of this decline was that poor countries constituted the only markets for the product. Some of these countries are growing fast and so it does their internal demand, meaning that their markets are in expansion.

Thus, the new phase can be called the "renaissance phase" (Tavassoli et al, 2013) taking into account the new reshoring trend. So, instead of a declivity or even disappearance of the product, this new state tries to explain the possible resurrection of the product when coming back to a western country. This new tendency can be explained by diverse factors presented later on.

#### **4.2. Why is reshoring attractive**

Manufacturing in the US has become more attractive in the last few years (Van den Bossche et al, 2014). Raw material availability may be an advantage, but also a shorten supply chain and a not having to deal with customs bureaucracy (Hutzel and Lippert, 2014). Organizations used to look at their location decision only considering costs, but now they are starting to give more weight to supply chain aspects and strategic factors (Ellram, 2013). So, for decades, developed nations sent jobs to countries where labor, engineering and managerial costs were much lower. But some years after, many of the companies that offshored manufacturing started to be affected by higher labor costs, higher raw material costs, and diminished responsiveness and quality (Tate et al, 2014).

Therefore, a number of different macroeconomic factors are starting to reverse the situation, at least for some industry sectors (Van den Bossche et al, 2014). Tied-up working capital is more frequent because of slow ocean transit and long distances between the designers and the production affect innovation. In addition, after the global crisis, western companies started to suffer from higher unemployment rates (Tate et al, 2014). The different factors are explored as follows.

#### **4.3. Influencing factors on strategic reshoring decisions**

*“A recent study of Danish manufacturers’ practice of globalisation strategies (outsourcing, insourcing, offshoring, and backshoring) indicates that insourcing and backshoring activities are expected to increase in the future (Arlbjørn et al., 2013). These findings align with the findings reported by Kinkel (2012), Ellram et al. (2013) and Tate et al. (2014).” (Arlbjorn and Mikkelsen, 2014).*

As reshoring is expected to become increasingly important, it is vital to examine which are the determining factors that lead the companies to rethink their offshoring decisions. There are several factors that can explain the pattern of bringing manufacturing back home from traditional offshore locations.

To have an overview of all the different factors, Table 2 shows the different literature references used and the reshoring reasons they described.



Author	Article	Factors													Travel	Image	Quality
		Labor cost	Tax structure	Skilled labor	Energy cost	Innovation	Suppliers location	Coordination costs	Flexibility	Reduce time to market	Currency exchange	Intellectual property	Automation	Land prices			
(Tate et al, 2014)	Global competitive conditions driving the manufacturing decision	X	X	X	X					X	X				X		X
(Tate et al, 2013)	Offshoring and reshoring: an update on the manufacturing location decision	X	X							X	X				X		
(Fratocchi et al, 2014)	When manufacturing moves back: Concepts and questions								X								X
(Gray et al, 2013)	The reshoring phenomenon: what supply chain academics ought to know and should do	X	X		X					X	X				X		X
(Kinkel, 2014)	Future and impact of backshoring: Some conclusions from 15 years of research on German practices	X															
(Kinkel and Maloca, 2009)	Drivers and antecedents of manufacturing offshoring and backshoring—A German perspective	X		X	X		X	X	X	X						X	X
(Leibl et al, 2011)	A study of the effects of backshoring in the EU										X						X
(Kinkel, 2012)	Trends in production relocation and backshoring activities	X		X			X	X	X								X
(BCG, 2011)	Made in America, again	X								X			X				
(Elfram et al, 2013)	Factor-Market rivalry and competition for supply chain resources									X							
(Lyles and Park, 2013)	The life cycle of internationalization		X							X							
(Ford, 2014)	Reshoring made simple	X				X	X								X		X
(Van den Bosch et al, 2014)	Solving the reshoring dilemma	X			X	X	X	X								X	X
(Dholakia et al, 2012)	The dynamics of inshoring	X						X			X						X
(The economist, 2013)	Coming home	X		X	X	X						X					X
(Tavassoli et al, 2013)	Manufacturing Renaissance: Return of manufacturing to western countries	X			X		X	X									
(Shih, 2014)	What it takes to reshore manufacturing successfully	X		X	X	X	X					X				X	X
(Tate, 2014)	Offshoring and reshoring: U.S. insights and research challenges				X							X					
(Arbjorn and Mikkelsen, 2014)	Backshoring manufacturing: Notes on an important but under-researched theme					X											X
(Hutzel and Lippert, 2014)	Bringing jobs back to the USA	X				X		X			X					X	X
(Elfram, 2013)	Offshoring, Reshoring and the Manufacturing Location Decision																
(Bock, 2008)	Supporting offshoring and nearshoring decisions for mass customization manufacturing processes			X													
(Zimmerman, 2013)	Contending with Chinese counterfeits: Culture, growth, and management responses																

Table 2. Articles VS Reshoring Factors

The analysis of each factor is presented as follows.

#### **4.3.1. Labor costs**

The cost of labor has always been an important factor for companies when considering where to locate their production. The wage differential is one of the most important drivers of offshoring to less developed countries (Tavassoli et al, 2013), (Kinkel and Maloca, 2009). The Danish statistics organization (Statistic Denmark, 2008) revealed that more than 50 percent of companies in Denmark, Sweden and the Netherlands considered the labor costs the primary reason for offshoring their manufacturing to developing countries, according to (Tavassoli et al, 2013).

Offshoring is mostly synonymous with China. In the last decades the Asian giant has become a huge exporter of manufactured products due to low labor costs and abundance of human capital (Hutzel and Lippert, 2014). So, in recent times China has become the world's largest manufacturing power, accounting for a fifth of global production, and it has come to this point producing a lot and really cheaply (BCG, 2012). Their success, however, has also been accompanied by changes in the labor rate (Hutzel and Lippert, 2014).

Hence, it looks like this situation started to change as factory workers began to claim for more rights. To take a case in point, the company Foxconn International, that employs 920.000 people in China, doubled wages after a string of worker suicides in their plant. Moreover, a Honda supplier factory raised wages by 47% after several strikes in 2010. Even though salaries started from a really low base, average wages have been increasing exponentially since 1999. From 2000 to 2005 Chinese wages incremented by 10% annually, while from 2005 to 2010 wages rose 19% per year. On the contrary, wages in the U.S. production workers rose just by 4% (BCG, 2012). Moreover, The economist (2013) points out that the US real wage decline in manufacturing after 2005 is around 2,2 percent. This significant deterioration is due to the financial crisis of 2008. After the crisis, the unemployment rate increased and, consequently, this situation induced people to accept lower wages in their new jobs (Tavassoli et al, 2013).

Thus, the advantages of cost-based relocation activities to low-wage countries seem to have been decreasing gradually (Kinkel, 2014). According to a Boston Consulting Group study (BCG, 2011), wages are increasing by 15 to 20 percent annually in China, and so labor-cost advantage between the US and China from 2011 until 2015 should have diminished from 55 to 39 percent, but the Chinese productivity improvement is not enough to offset the labor cost. So, the labor cost gap between the US and China or other emerging countries is receding ("Big Mac", 2013) according to (Tate et al, 2014). Actually, it is expected that the net manufacturing cost in US and China converge in 2015 for various industries such as computer and electronics (BCG, 2011), (Hutzel and Lippert, 2014). If this situation is finally

reached, it will no longer make sense to offshore production to China based on labor costs. However, this does not have to mean just the return of manufacturing to western countries because some firms may lead to offshoring to other less developed countries instead (Tavassoli et al, 2013). According to (Shih, 2014) some labor-intensive jobs are moving to other emerging countries but some high-profile manufacturing jobs are returning to the US. In the course of the global economic crisis, production relocation activities to Asian countries are gaining relative significance compared to European countries (Kinkel, 2011).

Nevertheless, when considering all of Asia, wages increased by 7,1-7,8% between 2001 and 2008 according to International Labor Organization, while in the advanced economies just rose by 0,5-0,9%. Pay for senior management in China, Brazil or Turkey is equal or even higher than in America or Europe in accordance with a recent study of the consulting firm Hay Group (The economist, 2013).

So why are wages increasing so fast? Wages in China are increasing because of factor market rivalry as the companies compete for the same resources (Tate et al, 2014). As Tavassoli et al (2013) also suggests it might also be possible because of two reasons. First, offshoring to another country will help develop their industry, implying an internal growth for demand in manufacturing and thus a wage-level increment. So, rising wages increases internal demand and, therefore, there is no such a need to export as before. Second, the return of highly educated Chinese from US or Europe to their home country has led to raising wages as these people normally have higher salaries than ordinary employees. As this growth has become evident, some companies have decided to move inland China to the pursuit of lower labor costs, but the transport and inventory costs are higher in these locations because of longer supply chain. So, as the labor costs are only a part of doing business, the overall cost must be less expensive when deciding to move into a specific location (Tate, 2014). As Gray et al (2013) argues, the original offshoring decision of the companies' managers relied on an attractive per-unit price, whereas the reshoring decision is based on a total cost analysis, which includes hidden costs.

Still, in a recent study (Tate, 2014), companies identified not just the importance of cost of labor but also labor cost stability as an important factor when deciding the manufacturing location decision. In the study, 58 percent of the respondents answered that in the last 3 years labor costs became more important. What is more, 43 percent indicated that the importance of labor cost stability also increased. When asked about the importance of these factors in the next 3 years, 66% of the participants said that labor costs would increase in importance and 59% of the respondents also mentioned that labor cost stability would be more significant.

In addition to this, US manufacturing productivity has improved in the last years (Tate, 2014) as a result of increased automation and Lean journeys. Lean implementation is

focused in eliminating waste in processes, making the workers more valuable than their offshored rivals (Hutzel and Lippert, 2014). This can be linked with the next important factor to consider, skilled labor.

#### **4.3.2. Skilled labor**

The western countries have always been well known because of their pioneer education, top universities and thus, skilled labor and innovation (Tate, 2014). However, the skilled and semi-skilled labor in China is starting to drop. The Economist announced that as the Chinese labor market is so congested, the high quality labor is starting to be insufficient (The Economist, 2013). As a consequence, companies have to hire less skilled people and quality can become a problem (Tate, 2014).

Still, the results carried out by (Kinkel and Maloca, 2009) in a survey that covered 1663 German companies show that the companies that offshored their production have standardized processes, meaning that the above-average of qualified personnel is lower than the ones that have not offshored. These last companies, that need more skilled personnel because of their challenging tasks, are more reluctant to low-cost offshoring activities. Moreover, in the course of the global economic crisis, availability of skilled labor and increasing labor costs have gained in importance as a factor of reshoring manufacturing. Actually, the availability of skilled labor has doubled in importance for reshoring activities since the beginning of the global crisis (Kinkel, 2012).

Notwithstanding, the reshoring trend is not a bed of roses when it comes to skilled labor. The US and other countries that have experienced offshoring have a lost generation in many important technical areas. So, Europe and the United States have not trained enough young people in the areas of metalworking and metallurgy for example. This means that there is a need of urgent investments in training and mentoring in some specific areas if we want the reshoring trend to be successful (Shih, 2014). So, some companies might think of offshoring to other emerging countries in search of a labor cost reduction.

Nevertheless, companies have to carefully analyze offshoring to a country that provides low worker wages because that would also probably mean low worker skills. While the impact of labor cost reductions can be directly evaluated, the influence of the worker skills is difficult to examine (Bock, 2008). Eventually, it looks like the labor costs would lose some importance in the next few years if the manufacturing plants are becoming more automated.

### 4.3.3. Automation

When production was offshored from Europe and the US to Asia the main driver was the search of low labor costs. Then, some automated processes were replaced with manual processes as they were less expensive and flexible (Shih, 2014). Notwithstanding, the average robot prices have fallen (Tate, 2014) by 40-50 percent since 1990 according to McKinsey (The Economist, 2013).

So, industrial automation is the use of control systems (robotics) in manufacturing processes. Hence, automation eliminates productivity as a factor to consider in the manufacturing location. The article (BCG, 2011) suggests that automation could solve China's lower productivity, but could also eventually remove the principal factor for companies to offshore, low labor costs. In the next graphic one might observe that the total cost savings in China with respect to the US would decrease until 13 percent in 2015. And this is before supply chain costs. In the hypothetical situation that factories in China achieve the same productivity relative to the US by 2015, the total cost saving will just improve by 2 percentage points until 15 percent, according to their analysis. See Figure 8.

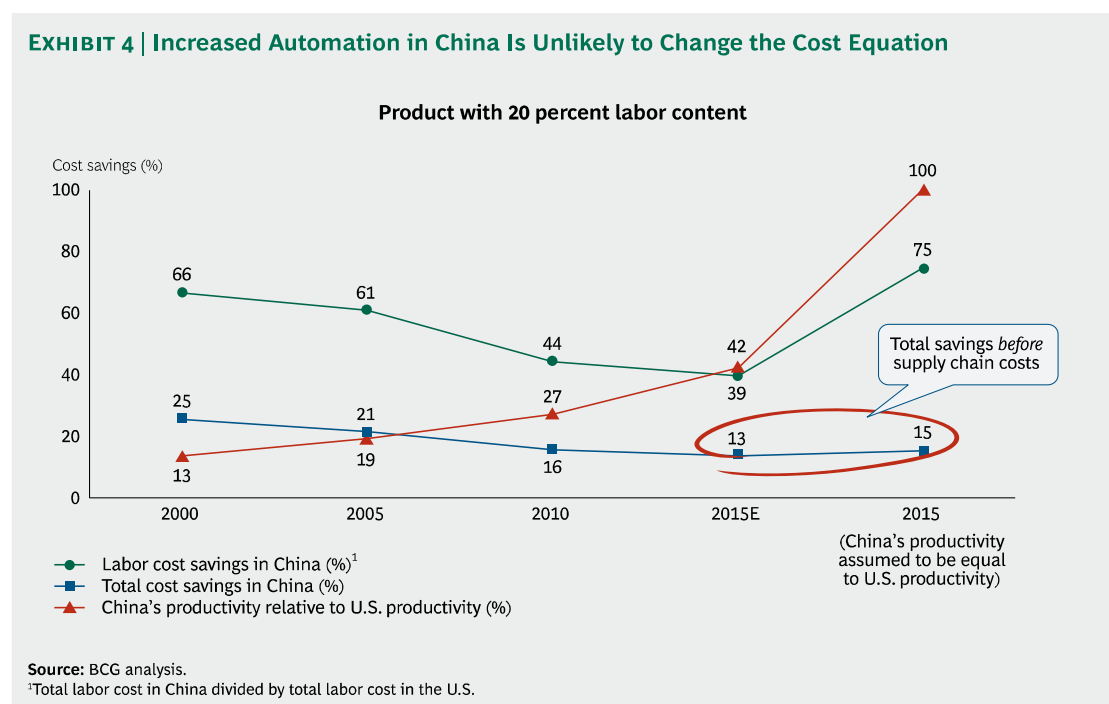


Figure 8. Increased automation in China is unlikely to change the cost equation (BCG, 2011)

Therefore, the companies that are reshoring to the US, like General Electric, are taking this opportunity to automate manufacturing processes in their new home investments (Tate, 2014). In the long term reshoring will imply more automation and thus, the manufacturing processes will be far less labor-intensive (The Economist, 2013).

However, according to (Shih, 2014), the return of manufacturing does necessarily imply using more automation. Apparently, manufacturing in China made fast product changeovers possible, so the consumers are accustomed and will expect to have this flexibility. Yet, the latest automation technologies are making it possible to reduce changeover times but there is still room for improvement.

Moreover, a large-scale Danish questionnaire-survey shows that the driving forces between large and medium-sized companies are different. Large companies appear to choose reshoring because of problems with lead-times, while some medium-sized companies see in reshoring an opportunity for automation. This could be due to the fact that large companies have already automated some of their manufacturing processes in the offshoring location (Arlbjorn and Mikkelsen, 2014).

What is clear, however, is that the progress made by robotics in the last decades is encouraging companies to consider automation as a good alternative. Robots are cheaper, user-friendlier and their cost is the same in America as in China (The Economist, 2013). In the next years automation will set the pace of large scale production. The skilled labor and automation can be linked to the next main driver for reshoring, quality.

#### **4.3.4. Quality**

One of the main factors why companies decide to reshore is because of loss of quality. Even though quantitative factors are important, the main reasons for reshoring are qualitative factors, indicating problems of transferring knowledge on how to run reliable production processes efficiently to the foreign location (Kinkel and Maloca, 2009). Quality is vital to survive on the market as the customers are demanding and want the best products. What is more, social media can also play an important role as consumers increasingly make product reviews on Internet shopping sites. Then, an imperfection in a single product can cause devastating consequences (Ford, 2014).

In manufacturing, quality comes from the materials, the production processes, control and traceability (Hutzel and Lippert, 2014), (Ford, 2014). Two German surveys (Kinkel, 2012), (Kinkel and Maloca, 2009) showed that while reducing labor costs was the main motive for relocating production abroad, the main incentive for production reshoring decisions was quality. However, though, a survey made by ATKearney revealed that the improvement of the quality was the third main reason for companies to reshore, after delivery time improvement and total cost of ownership (Van den Bossche et al, 2014). Moreover, on two other surveys conducted by the "Fraunhofer Institute for Systems and Innovation Research (ISI)" and "the London-based Engineering Employers Association", to German and British firms respectively, showed that quality concerns were the main drivers for reshoring, according to (Leibl et al, 2011).

The reason why quality can become a problem is because processes are not easy to transfer to other countries and they cannot be exactly the same than the ones in the origin state (Kinkel, 2012). Furthermore, in many cases a problem in a vendor's product can lead to major difficulties in manufacturing, so dealing with nearby suppliers can be easier than with offshored ones. A container load of bad parts is a problem much bigger than a crate of bad parts. That is because the amount of product that a company buys from a company in another country it's normally larger to avoid high shipping and tax costs. Also, if there is a quality product problem, the time to restore it and get new product is longer if the companies are not nearby. Being separated by long distances makes fixing problems more difficult (Hutzel and Lippert, 2014).

Therefore, quality is critical. Companies like Sauder, Crown Battery and Oregon Small Wind Energy Association decided to reshore after some critical issues with the quality of their products (Dholakia et al, 2012). Also, a start-up company from California called ET Water Systems decided to reshore their manufacturing from China because of quality and innovation problems (The Economist, 2013).

Quality in manufacturing comes from control, meaning that work is always done accurately and, if there is any production problem, it can be solved in the minimum amount of time and with the lowest overall cost. Having production close to the end customer provides better control on manufacturing execution as there is a fast market feedback (Ford, 2014). This can be connected to the next factor, reducing time to market.

#### **4.3.5. Reduce time to market / Logistics**

It is clear that reducing time to market and make your supply chain faster is one of the main objectives to reach when locating a manufacturing plant. Supply chain resources are strategic for achieving the firm's competitive advantage (Ellram et al, 2013). According to (Williamson, 2012), the fast response time and leaner supply chain is one of the drivers of the global manufacturing location decision today (Tate, 2014). Supply chain interruption risk is a notable concern when choosing East and South Asia, Africa, South America and the Middle East (Tate, 2014). What is more, the rises in oil prices and transportation costs and the increasing perception of supply chain risk have contributed to make the US a more seductive location (Tate, 2014), (Hutzel and Lippert, 2014).

Yet, the objective of a company when talking about their supply chain is to reduce the length to better manage inventory levels and working capital (Tate et al, 2014). There could be dangerous implications for omitting logistics issues when moving to another location (Ellram et al, 2013). To take a case in point (Fishman, 2012), a company called GeoSpring reduced from 5 weeks to 30 minutes the time of delivery to their distribution center, as (Tate et al, 2014) claims. As Ford (2014) stated, some key manufacturers in China even

decided to ship by air to avoid these problems, but this decision obviously makes the product more expensive.

Hence, companies should verify that their supply chains are flexible, dynamic and globally balanced. They should also measure the benefits of establishing manufacturing close to customers, such as inventory reduction, reducing time to market, cutting down on geographical and geopolitical risks and make design changes in a faster way (BCG, 2011), (Ford, 2014), (Shih, 2014), (Tate et al, 2014).

As stated in transaction cost theory, long distances contribute to very costly supply chain coordination activities. Furthermore, multi stage supply chains, with lots of suppliers and different locations, are exposed to more possible problems that can damage the whole chain (Kinkel, 2014). So, the ability of organizations to coordinate their global logistics system is what determines its success (Ellram et al, 2013). As a matter of fact, any supply chain will be executed in a better way with good interaction across all its sections. Indeed, a local supply chain can response faster than one that has weeks or months of inventory in containers coming from China (Shih, 2014).

Further, if companies consider the possibility to move to another developing country, they need to take into consideration that they might have a poor infrastructure. As Ellram et al (2013) suggest, Vietnam is 20 years behind China when it comes down to their infrastructure.

Another point to note is that most of the manufacturers now stock up on supplies or parts instead of on finished goods. Consequently, the storage space used is the same but they have less money secured in inventory since the value of the finished goods is higher (Van den Bossche et al, 2014).

Furthermore, for some companies the proper functioning of their logistics is vital to achieve the best results. In a survey made to several companies that decided to reshore to the US, see figure 9, various reasons were linked to being closer to the customer, and the main one was the delivery time improvement (Van den Bossche et al, 2014).



### Top 10 Reshoring Reasons

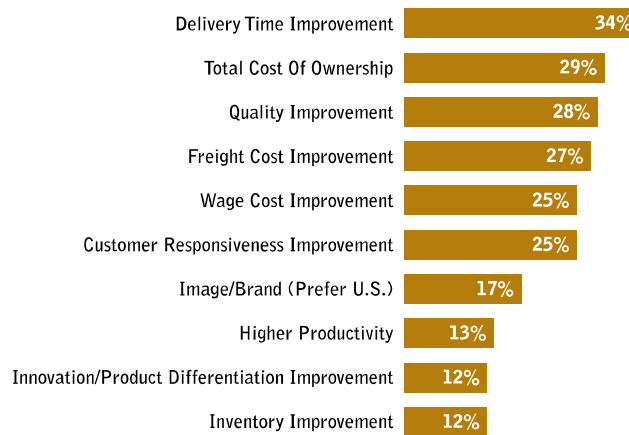


Figure 9. Reshoring reasons (Van den Bossche et al, 2014)

In addition, in a survey made by (Kinkel and Maloca, 2009), companies of the manufacturing sector appointed flexibility and delivery ability as the most important reason for bringing manufacturing back home. Besides, they also point out that this reason gained in importance over the previous 2 or 3 days.

To understand the importance of the supply chain, it must be borne in mind that the cost of the entire distribution chain from China to the US is about 80% of the total cost of the product, which is surprisingly high (Ford, 2014). Hence, the expected cost, inventory and even service benefits connected to reshoring are far from guaranteed (Van den Bossche et al, 2014). Nevertheless, China has reached a point where it has the best supply chains of components for industry in the world, with a well-functioning network and infrastructure. Therefore, some companies that moved in the search for lower labor costs, now still want to stay because it has become a good place to do business due to their internal increasing demand and good infrastructure (Van den Bossche et al, 2014).

As reported by (Gray et al, 2013), one of the ways to contribute to reshoring and manufacturing location decision research in general is to understand and quantify the hidden costs of long supply chains. Between these costs we can find the coordination costs and problems with flexibility.

#### 4.3.6. Coordination costs / Flexibility

According to (Gray et al, 2013), a possible explanation to clarify the offshoring-reshoring path is that companies offshored on the search for easily measurable expenses such as labor costs, while they have reshored based on experiencing and learning about the real difficulties of producing abroad in practice, like midnight phone calls, delivery delays, IP leakage, communication challenges, travel). These difficulties result in coordination costs and loss of flexibility.

Quick changes are obviously more difficult to achieve if the location of the production is not in the home country (Hutzel and Lippert, 2014). As pointed out in the previous factor, in accordance with transaction cost theory, long physical and mental distances make it hard to coordinate activities (Kinkel and Maloca, 2009). Thus, according to Figure 10, it can be seen that flexibility and coordination efforts are main drivers when deciding to bring manufacturing back home.

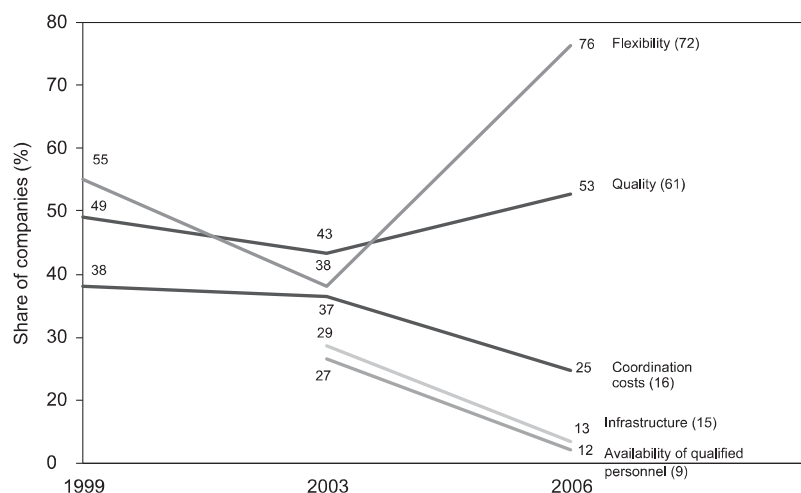
**Table 1**  
Reasons for backshoring according to the backshoring mode (n=34).

Reasons for Backshoring (2007 to mid 2009)	Captive Backshoring (%)	Outsource Backshoring (%)	Sig.
Quality	57.9	80.0	*
Flexibility, ability to supply	52.6	53.3	
Coordination efforts	31.6	6.7	
Transport/logistics costs	26.3	46.7	
Availability of qualified personnel	21.1	20.0	
Labour costs	21.1	33.3	
Know-how loss	5.3	0.0	
Proximity to home-base R&D	0.0	6.7	

*Figure 10. Reasons for reshoring (Kinkel, 2014)*

In a survey carried out by (Kinkel and Maloca, 2009) to German metal and electrical companies, the results show the evolution and importance of flexibility and coordination costs from 1999 to 2006. Figure 11 illustrates this evolution.

*S. Kinkel, S. Maloca / Journal of Purchasing & Supply Management 15 (2009) 154–165*



*Figure 11. Evolution of reshoring factors (Kinkel and Maloca, 2009)*

The study also suggests that almost all companies tend to underestimate coordination costs when producing abroad. An important reason could be the difficulty of transferring project-planning calculations to foreign countries where they have to cope with geographical and cultural peculiarities (Kinkel and Maloca, 2009).

Moreover, another study surveyed by the Fraunhofer Institute for Systems and Innovation Research (ISI) in Germany cited flexibility to respond to changing conditions (39,5%) and coordination and communication costs (28,5%) as important drivers to reshore to Europe (Leibl et al, 2011). Accordingly, (Dholakia et al, 2012) mentioned “inefficiencies resulting from spatial separation” as an important factor that motivate companies to locate their production in the US. Along the same lines, on another survey, (Van den Bossche et al, 2014) notes the importance of freight cost improvement (27%) as a reshoring factor.

Eventually, if there is a firm that wants to locate its manufacturing abroad in the long term, it has to try to maintain its optimum flexibility and foresee the coordination and communication costs (Kinkel, 2012). However, this may be hard to predict in most cases. Anyway, the firm must strive to analyze both flexibility and mobility because they are becoming more and more essential for all types of companies. In conjunction with this, innovation is another important driver to take on board.

#### **4.3.7. Innovation**

To have improvements in production or innovation in products the whole company has to be involved. If manufacturing is separated from management, the performance of R&D, purchasing, engineering, product innovation and improvement is affected by the distance and disunion (Hutzler and Lippert, 2014). For instance, a company from California called ET Water Systems decided to bring manufacturing back to California because the innovation of its products was affected by the distance between manufacturing and design (The Economist, 2013). When firms decided to move production abroad, at the beginning the methodology and processes were suitably understood, but as the designs of the products started to change, some difficulties appeared when it came to produce this new products due to connection and communication problems (Shih, 2014).

Reshoring can reduce costs through better design and manufacturing agility (Ford, 2014). Actually, one of the driving forces behind reshoring production to Denmark, especially on large companies, has been having manufacturing close to R&D department (Arlbjorn and Mikkelsen, 2014). Thus, having production closer to market provides a better control on manufacturing execution (Ford, 2014), and this leads to innovation facilities. As the head of the plastics competency center at Appliance Park explains, “Having the work in-house is important for our learning. Having that design piece of this thing on-site, having the design team interact with the operators who actually make it, and seeing the tools open up on the bench, how the tool works, the thought process — learning that and how that cycles back into the design — there is a value to that” (Shih, 2014). Reshoring offers the possibility to go back to the times where product design and manufacturing were not separated by long distances, paving the way for easier product innovations. But for making reshoring easier, the location of the suppliers is also important. For firms seeking an innovation leadership

strategy, being closer to innovative suppliers as well as innovative customers is vital (Kinkel and Maloca, 2009).

#### **4.3.8. Supplier's location**

It would be ideal for a company to have all their suppliers as closer as possible and thus minimize transportation costs. Unfortunately for them, it is impossible to have all their suppliers face-to-face with their plant. However, before the offshoring trend began, domestic networks were stronger and there were large number of suppliers in either Europe or the US. As Teece (1986) suggested, economies of scale can reduce production costs. This can be executed through proximity with lots of different suppliers in a specific region or country (Tavassoli et al, 2013). Often, a company just identify the importance of a supply network when is no longer available (Kinkel and Maloca, 2009).

Even though it is very difficult to build and develop competent foreign suppliers networks particularly in low-cost countries (Kinkel and Maloca, 2009), in the long-term it may be possible to achieve them. Consequently, one of the offshoring consequences is that some suppliers followed their customers overseas, so the western domestic networks have been weakening substantially (Van den Bossche et al, 2014). Suppliers companies are often requested by their key customers to move their production close to them and build up a new supply base in the foreign region (Kinkel, 2012), (Shih, 2014). A manager of a large automotive supplier said that "Customers pursuing just-in-sequence-strategies call for close proximity, otherwise you will lose the contract" (Kinkel and Maloca, 2009). In consequence, some companies that are willing to reshore are finding that their home industrial fabric (industrial commons or clusters, previously explained) has been evaporating in the last years. This can reduce the benefits of bringing production back home (Van den Bossche et al, 2014).

In industries such as electronics, there are limited suppliers now in the US. To take a case in point, all of the pieces of the smartphone MotoX, produced by Flextronics International Ltd. in cooperation with Google, are manufactured in Asia. On the other hand, it is impossible to find domestic suppliers of touchscreen displays or batteries in the US for example, so if they decided to assemble the smartphone in the US they would have to import semi-finished parts, with all the expenses that that would entail (Shih, 2014). In addition to that case, when the company Appliance Park brought manufacturing to the US, the managers reconsidered the strategic view of their suppliers. They had to rebuild internally core competences and for the rest rely on their suppliers (Shih, 2014).

However, there is still room for hope as there is cooperation between manufacturers and suppliers to work together in the reshoring process (Ford, 2014). The company Wal-Mart conducts supplier conferences to encourage manufacturers to produce in the US by

guaranteeing to purchase \$50 billion in home manufacturing goods in the next 10 years (Shih, 2014). Moreover, with the emergence of the global world crisis, several companies decreased their activity and, thereby, also decreased the pressure to suppliers to follow them overseas (Kinkel, 2012).

So reshoring can reunite product design and manufacturing, but also strategic suppliers ecosystems and original equipment manufacturers. Companies need to think in long-term rather than short-term over price (Shih, 2014). Furthermore, it is also important to think about the possible intellectual property risks of locating a manufacturing plant in a certain country.

#### **4.3.9. Intellectual property**

Intellectual property is a valuable corporate asset that needs to be well protected (Hutzel and Lippert, 2014). A number of different factors have been suggested to describe the intuitive effect on location factors and one of them is intellectual property risk (Tate et al, 2013), (Gray et al, 2013), (Dholakia et al, 2012), (Tate, 2014), (Hutzel and Lippert, 2014), (Leibl et al, 2011). Undoubtedly, the legal protection in the US does not exist in some developing countries (Hutzel and Lippert, 2014). So there have been some companies that have faced this problem of counterfeiting and decided to move their production back to the US to protect their intellectual property, such as Farouk Systems (Dholakia et al, 2012). Protecting intellectual property in a company can let to inestimable cost savings (Hutzel and Lippert, 2014).

Then, why are employees more willing to steal documents in one country than another? There are obviously cultural differences between countries; ethics and values can differ significantly (Hutzel and Lippert, 2014). If we focus on China, Confucianism and Communism hold no concern about personal property (Zimmerman, 2013). Fighting counterfeit goods in China is very difficult. Almost every product is pirated there and the government seems to be looking away (Zimmerman, 2013). Therefore, firms that need to preserve their technological specifications or innovations to have advantages over their competitors can be in danger when producing offshore in certain countries (Hutzel and Lippert, 2014). Taking a look at the next Figure 12 and Figure 13, from the (European Commission Taxation & Customs Union, 2011), one can observe that China is the country that contributes to a greater extent sending counterfeit goods to the United States and Europe (Zimmerman, 2013). More to the point, the counterfeit goods value may easily exceed \$150 billion annually (Zimmerman, 2013).

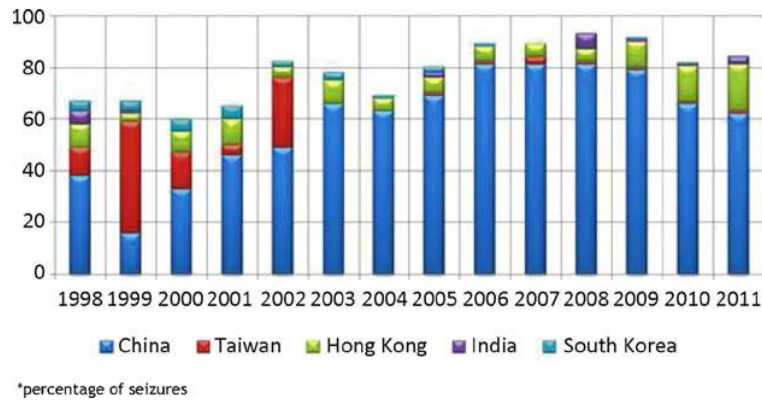


Figure 12. US seizures by country of origin (Zimmerman, 2013)

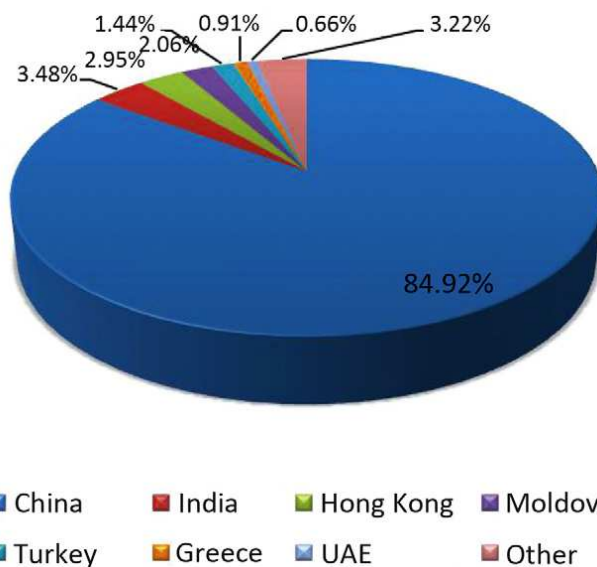


Figure 13. EU seizures by country of origin (Zimmerman, 2013)

Accordingly, this counterfeiting risk can tip the balance to reshoring. Some countries have lax laws regarding the theft of intellectual property, e.g. according to (Frank, 2005) an employee in India was absolved after sending key documents to his personal address (Tate, 2014). Thus, it is not just a problem of people's mentality, the law is also softer and this leads to a vicious circle. If a crime goes unpunished, people will continue acting the same way thinking it is the correct one.

Therefore, as it seem that counterfeiting in China will remain a persistent problem (Zimmerman, 2013), managers must try to protect the integrity of their brands, and so they must try to find a secure country to locate their production. The other focus of attention when looking at a country political situation is the tax structure.

#### **4.3.10. Tax structure**

The tax structure of a country plays a very important role in the location decision (Gray et al, 2013). Countries such as Ireland, China and India have been accused of having a soft tax structure that attracts rich companies (Tate et al, 2014). In consequence, they have an unfair advantage over the other countries. Hence, even though the Middle East was seen as a very risky region in a survey carried out by (Tate et al, 2013), the perception of a favorable Government Trade Policy situation make it attractive for most of the companies surveyed.

On the other hand, according to (Yuan, 2013) there are other countries like the US that are far from being an attractive location option regarding their high tax rates (Tate, 2014). However, it may also depend on the state. Individual states may view this as an opportunity and offer different incentives to capture new companies (Tate et al, 2014). As (Lyles and Park, 2013) for example suggests, Indiana needs to promote its low taxes as a location choice determinant.

Thus, Government Trade Policies are important to make a region attractive. Being favorable for business matters can certainly help a country to attract new companies (Tate et al, 2013). However, most of the global firms believe that tax risks have decreased or at least have been in the same situation in the last years. In a survey made by (Tate et al, 2014) to 319 companies that currently manage offshore manufacturing plants, over 50% indicated that tax advantages will have the same importance in the next 3 years than in the last 3 years. About 60% of the companies believe that tax risks have decreased, while just the 24% of them declared that they would give more importance to tax advantage in the location choice over the next 3 years (Tate et al, 2014).

On the other hand, though, (Mann, 2012) points out that government trade policies appear to be gaining significance in the location decision (Tate et al, 2013). In any event, company managers should elaborate a long-term tax risk analysis whenever they decide to locate their production to avoid any unpleasant surprises. Moreover, another important aspect to consider is the cost of the energy.

#### **4.3.11. Energy cost**

Energy represents a significant manufacturing cost for a company (Tate, 2014), (Tate et al, 2014). Many studies have shown that the energy cost is an important aspect to consider in the location decision (Gray et al, 2013), (Kinkel and Maloca, 2009), (Van den Bossche et al, 2014). Besides, is not just the rising cost of energy what is important for the future of manufacturing but also its efficacy (Tavassoli et al, 2013).

Nowadays, according to the International Energy Agency (2012), the US has the minimum cost per megawatt compared to any country, the second lowest cost of industrial natural gas behind Canada and the second lowest cost of diesel fuel in back of Mexico (Tate et al, 2014). What is more, the fracking initiatives in the US are expected to help keeping the electricity costs 40% to 70% lower than in Europe or Japan. A report of the accountancy firm PWC suggests that these lower energy prices can bring 1m more manufacturing jobs in the US (The Economist, 2013). Nevertheless, some uncertainty exists about the capacity and longevity of fracking in the US (Van den Bossche et al, 2014).

Conversely, China's energy costs have kept on growing because of important dependence on imports and lack of energy supplies (Tate et al, 2014). However, according to (The New American, "United States to become the world's primary energy producer in four years) China has greater reserves of shale gas than the US and, although they are more hardly accessible, it is ambiguous to ensure that the US can count on their fracking reserves as a sustainable energy cost advantage (Van den Bossche et al, 2014).

In addition, the cost of transportation is also affected by the energy cost. Obviously, it is cheaper to transport goods from a local supplier than from a supplier located far away on energy terms (Tavassoli et al, 2013). In a survey conducted by (Tate et al, 2014), the respondents showed a lot of concern about the stability of the energy costs. Indeed, over 60% of them mentioned that this factor gained importance over both the last 3 years and the next 3 years regarding the manufacturing location decision.

Another key aspect in regard to the manufacturing location decision is the currency exchange.

#### **4.3.12. Currency exchange**

Currency exchange rates have been a topic for discussion among international trade for many years (Hutzel and Lippert, 2014). Changes in currency valuation can certainly have a negative effect of doing business outside of one's own currency.

Some decades ago China seemed to be the clear choice in part because of its artificially low currency and government incentives (BCG, 2011). However, if we compare the Chinese Yuan and the US Dollar from June 2003 to June 2013, the Asiatic currency strengthened by 35% against the American (Tate et al, 2014). This is probably because, since joining the World Trade Organization in 2001, China has been under pressure to reflect market demands (Hutzel and Lippert, 2014). Then, one of the reshoring favorable aspects is the appreciation of China's currency versus western currencies (Van den Bossche et al, 2014). In the next graph, Figure 14, we can have a look at the evolution of the EUR and USD in front of the



CNY, and it can be seen that there the Chinese Yuan has been strengthening in the last few years.

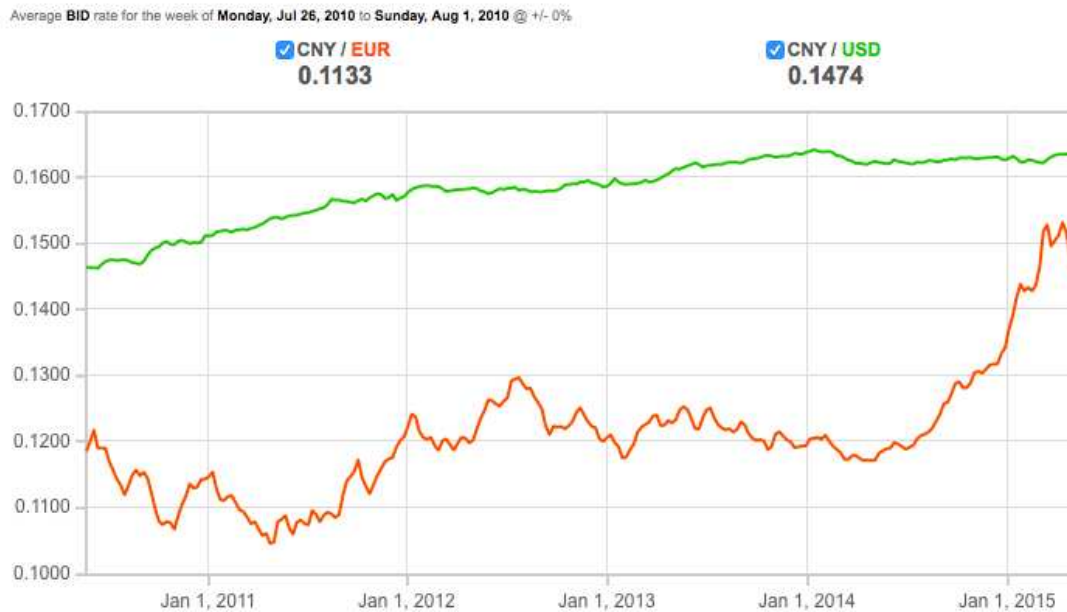


Figure 14. Evolution of the EUR and USD in front of the CNY (Oanda, 2015)  
[\(http://www.oanda.com/currency/historical-rates/\)](http://www.oanda.com/currency/historical-rates/)

In a survey conducted by (Tate et al, 2014), 27% of the respondents of the different companies indicated that currency stability had grown in importance in the manufacturing location decision in the last 3 years. When asked about the next 3 years, 33% of them suggested that it would gain even more ground.

Exchange rates create uncertainty because they are in constant change. Then, for small businesses, which need more stability, may be better to keep the production domestic (Hutzel and Lippert, 2014). What is clear is that, apparently, western currencies are more solid and stable at this moment compared to other ones.

#### 4.3.13. Environmental regulations

*“As environmental regulations become more synchronized and standardized across global supply chains, the pendulum should swing in favor of reshoring.” (Gray et al, 2013).*

Economically speaking, the most logical thing to do is relocate production to regions with less strict environmental regulations. Therefore, this might let firms to offshore in the search of cost savings. Nevertheless, although this assertion is probably true, regulations that look upon the whole supply chain will be in favor of reshoring (Gray et al, 2013), (Ford, 2014), (Tate et al, 2013)

Thus, environmental instability may be one of the causes that can drive an organization to consider reshoring (Tate et al, 2014). Moreover, if a company has CSR (Corporate Social Responsibility), it should not just be to clean its image but also to preserve ethical standards and international law.

There are some initiatives to regulate the environmental impact in the whole supply chain. As an example, the UK, Canada and Japan have started carbon-labeling programs. However, in a survey conducted by Accenture in 2008, only 10% of the respondents of 245 companies indicated that they had evaluated their carbon emissions (Gray et al, 2013).

In conclusion, the potential advantage of reshoring is greater visibility, commonality and enforcement of sustainability laws (Tate et al, 2014). As Gray et al (2013) suggests, governmental activities in favor of environment regulations can encourage firms to reshore, leading then to less overall pollution. Besides, the preference for the products made in America or Europe is growing fast in front of the Eastern countries.

#### **4.3.14. Image**

Customers always tend to buy products with the best price-performance ratio, but the quality of a product is key factor for them. Thus, the “Made in America” designation is used to identify the product with quality and improvement (Van den Bossche et al, 2014). For instance, the company Wal-Mart holds conferences to encourage companies to come back and promote “Made in USA” (Shih, 2014). Moreover, since the wage costs differential between China and the US has been reducing in the last years, some part of the manufacturing may return to the US to meet the customer demand on products made in the US (Tavassoli et al, 2013).

Patriotism can also stimulate some reshoring even though there might be not an economic justification for it (Hutzel and Lippert, 2014). Then, no one knows which is the price premium that a customer is ready to pay for a product manufactured in the US. The return of some sensitive products to the US, such as baby food, can be justified by better regulation and safety. Then, there are some products that can justify a higher price (Van den Bossche et al, 2014). However, it appears quite difficult to achieve that the customers become active and start to read the labels of every product they buy. Instead, another alternative that might bring to a better success is that companies purchase American products (Hutzel and Lippert, 2014).



*Figure 15. The weakening of products Made in China (The Economist, 2013)*

Another factor to consider in this list is travel.

#### **4.3.15. Travel**

When a company offshores its production to Asia, travel costs need to be considered, not just in economic terms but also as lost of time and difficulties to work effectively in an unfamiliar culture (Hutzel and Lippert, 2014).

Then, one of the hidden costs that companies have experienced when moving their activities offshore is travel (Gray et al, 2013), (Leibl et al, 2011). The Chinese business culture is different from the one in the western countries. Dining etiquette is strict, so you need to drink and toast in an appropriate way and you also need to know the courses and plate changes during the meal. Therefore, travel costs, time away from the main office and lodging costs must be considered when considering offshoring as an option (Hutzel and Lippert, 2014). In addition to this, one of the reasons for companies to offshore was also the cheaper land price.

#### **4.3.16. Land prices**

Since some decades ago, China has been offering a really good combination of advantages to attract companies to locate their manufacturing there. One of these advantages was the cheap price of the land.

However, industrial land in China is not cheap anymore. For instance, the price of land in Ningbo is \$11,25 per square foot, \$14,49 in Nanjing, \$17,29 in Shanghai and \$21 in

Shenzhen. This gives an average for the country of \$10,22 per square foot. On the other hand, industrial land in Alabama for example costs only \$1,86 to \$7,43 per square foot, while in Tennessee and North Carolina it fluctuates from \$1,30 to \$4,65. Accordingly, land prices are definitely higher than in most parts of the US (BCG, 2011).

Therefore, a few decades ago land prices in China were cheaper than in the US or Europe, but the situation has reversed in favor of the western countries. In the search of lower land prices, companies can decide to move inland China or even to other Asiatic or African countries, but in doing so they will need to face higher transportation costs as a consequence of leaving an industrial common (BCG, 2011).

#### **4.3.17. Others**

The weather, natural disasters and political issues can put a company at risk. It is always better to manage a bad situation if a company keeps local, rather than if it goes to a location that may be at risk (Ford, 2014).

Furthermore, (Dholakia et al, 2012) also suggests “knowledge that can’t be externalized efficiently” and “xenophobia and protectionism in advanced economies” as factors that motivate can motivate companies to locate their production facilities in the US.

Moreover, another important aspect is legal certainty and stability. The legal security that exists in the Western countries may not be guaranteed in some developing countries, due to totalitarian and unstable governments.

Finally, (Hutzel and Lippert, 2014) suggests cash as another factor to consider. Offshoring vendors usually ask for payment in advance. This might be a problem for companies short on cash not only because of the prepayment but also because they have to order larger quantities. Moreover, when the product arrives in port, it also takes longer to sell because the quantity is larger and, consequently, it takes longer to recover the cash.

After having analyzed the different factors that can lead companies to reshore manufacturing to the west, let’s have a focus on the potential of reshoring in Europe.

#### **4.4. Potential of reshoring in Europe**

Reshoring offers a real possibility to create jobs and restore the industrial competitiveness of Europe. Companies look for better quality, shorter lead times and fewer problems in their supply chain, as well as efficiency and avoidance of expensive coordination costs.

To have an idea of the wages in Europe before the global crisis, Table 3 illustrates the labor cost per hour in 2007. One can observe the huge differences between countries. For example, an hour of labor costs in Denmark is 7,3 times as much as in Latvia (Leibl et al, 2011). This can explain why some companies decided to offshore to other parts of Europe.

Country	Labor Cost €/Hr. 2007	Country	Labor Cost €/Hr. 2007
Denmark	35.0	Greece	16.7
Sweden	33.4	Cyprus	14.5
Belgium	33.1	Slovenia	12.5
Luxembourg	32.7	Portugal	11.1
France	31.9	Malta	9.8
United States	29.4*	Czech Republic	8.1
Netherlands	29.2	Hungary	7.7
UK	29.2	Estonia	7.9
Germany	29.1	Poland	6.7
Austria	28.5	Slovakia	6.4
Finland	28.3	Lithuania	5.2
UK	29.2	Latvia	4.8
Ireland	25.2	Romania**	3.9
Italy	24.5	Bulgaria**	2.1
Spain	18.3		
* Auto worker, benefits excluded			
** Not an EU member			

Sources: ~~F~~otoshow – Arbeitskosten: Die Preisbrecher in Osteuropa,||

*Table 3. Labor cost per hour in Europe, 2007 (Leibl et al, 2011)*

Moreover, to have a rough idea, in Europe the manufacturing sector provides 32 million direct and 20 million indirect jobs nowadays, according to BusinessEurope (Needham, 2014).

Offshoring and reshoring in Germany, the UK and France have been driven by similar factors, with a special emphasis on quality concerns, transportation costs and labor wages. However, even though Spain has the fifth highest GDP in the EU, there is not evidence of a lot of cases of reshoring, probably because labor costs were already low when other European companies decided to offshore a few decades ago (Leibl et al, 2011). Anyway, most of the countries want to have a strong manufacturing sector.

But which are the main factors that the European companies consider when reshoring? Table 4 shows the reasons of different German companies that decided to relocate their production back home.

Company Name	Product	Production Returned From:	Reason(s) Cited for Returning
Bellicon	mini-trampolines	China	quality, logistics
Friatec	industrial valves	China	quality
Hirschmann	electrical cables and connectors	China	quality, rising production costs
Jungheinrich	forklifts	UK, France	quality problems, exchange rate fluctuations
Katjes	candy	Italy, Finland	unsatisfactory quality control
Lemke	farm equipment	Russia	quality, banking problems, customs problems at border
Ritter-Sport	chocolates	Russia	foreign ingredients (milk and sugar) negatively affected product taste
Steiff	teddy bears	China	inconsistent quality
Stiebel Eltron	water heaters	Slovakia	quality
Vorwerk	vacuum cleaners	China	transportation costs
Weigelt	injection molding machines	Czech Republic	logistics

Source: ~~F~~otoshow – Genug von Billigländern - Diese Firmen sind zurückgekehrt, (2008) <http://www.t-online-business.de>.

*Table 4. Reshoring reasons of different German companies (Leibl et al, 2011)*

But not all the products can be reshored to Europe. There are some of them that are more likely be reshored, such as heavy machinery, goods in constant change for consumer demand and products with whom safety is an important issue (Needham, 2014). So, what has Europe been doing so far?

*“The European Commission is urging Member States to recognise the central importance of industry for creating jobs and growth and to mainstream industry-related competitiveness concerns across all policy areas. This is the key message of the communication For a European Industrial Renaissance, adopted today.”*

Europe is starting to act in favor of reshoring. Communications from the European Commission in 2012 (A stronger European Industry for growth and economic recovery) and in 2014 (For a European Industrial Renaissance) are seeking to increase manufacturing share of GDP from 15% to above 20% after 2020, where it was 15 years ago (Needham, 2014).

Besides, The Regional Development Committee supported “reshoring initiatives seeking the re-entry of production and services from third countries” on a report on January 2014. In

addition, the resolution found out that every industrial job creates two more jobs, either in supply or service sectors (Needham, 2014). Then, it is really important to give an effective boost to reshoring in Europe.

Yet, European countries still need to recognize the full scale of the problem and take firm and decisive action to rebuild the industrial competitiveness and create new important jobs. American companies, though, are one step ahead compared to the European ones.

#### **4.5. Analysis of American reshoring cases**

There are some companies that have already brought manufacturing back to the United States. These companies had some experience with offshoring and realized that was not as ideal as expected.

One of these companies is Caterpillar. In 2010 the company announced a \$120 million new plant in Texas, with a capacity to employ 500 people. The company offshored its production from Japan and still has a plant in China to produce for the Asiatic market. The reason for coming back was that the company expected increasing demand in North America and Europe and wanted to avoid high logistics costs. Nowadays, everything suggests that US production costs are competitive all around the world (Hutzel and Lippert, 2014).

Another company that reshored its production to the United States is Master Lock. Although there is still some production in China, the company brought back more than 100 jobs. The key factors were demanding pay increases from the Chinese workers, the currency exchange rate favoring the American currency and a fourfold increase of the shipping costs in just one year (Hutzel and Lippert, 2014).

Neutex also saw the benefits of reshoring. This young company found out that its productivity in China was one-quarter that of the US and experienced unplanned delays. In addition, the assumption that low labor costs would not change was erroneous and wages rose significantly. Quality became a problem too and having the plant abroad made it difficult to solve. Travelling to China consumed substantial time and money and payments in advance for products that took 2 months or longer to arrive to the US became also a problem (Hutzel and Lippert, 2014).

Similarly, General Electric is bringing the production of some products back home. Apart from the reasons mentioned in the other reshoring companies, General electric considered other factors in its decision. The adoption of Lean manufacturing (reduction of waste and improvement in productivity) was an important aspect to locate some production back home. Also, General Electric worked with the International Union of Electrical Workers to lower the wage base in her plant. This reduction of wages in the US and the increase of the

wages in China made its home plant even more attractive. Finally, the company received government incentives worth \$17 million that definitely helped tipping the balance in favor of reshoring (Hutzel and Lippert, 2014).

The last company is WindStream Technologies, a renewable energy company founded in 2008. In December 2010, the company decided to start production in China due to low costs and speed. The consequences were tragic, though, as the quality was really far from expected. After this bad experience, the company decided to locate its production in the United States. The next Figure 16 illustrates the summary of the reshoring factors of the different companies.



*Figure 16. Reasons for reshoring*

After having analyzed these companies, it is clear that every one of them is different and, thus, the factors that led them to reshore are not exactly the same. Then, every company has to be evaluated individually if the success wants to be assured. However, some aspects considered previously are the same, so for companies that have in mind the possibility to reshore it is always interesting to learn from other companies to facilitate the process. Going further, even though these companies brought manufacturing back home and are being competitive, reshoring in practice is more complex than one might probably think.

#### **4.6. Complexity of reshoring in practice**

Even though almost everything points to the greatness of reshoring, when it turns out into practice there can be some problems and issues that must be anticipated beforehand. One of the bigger problems that a company can face when coming back is the scarcity of skilled resources (Hutzel and Lippert, 2014).



Yet, it is not just about scarcity of skilled people but also deficient supply chains and lack of motivation to work in factories (Hutzel and Lippert, 2014). The company PricewaterhouseCoopers sponsored the Stanford Global Supply Chain Management Forum (SGSCMF), where the participants noted that manufacturing skills have atrophied in the US in the last years (PWC, 2013).

Moreover, American supply chains are damaged by offshoring, especially for products controlled by Chinese manufacturers. Then, nowadays it might be extremely difficult and challenging to find suppliers for these specific products in the US (Hutzel and Lippert, 2014).

In addition, one can think that there is a lack of motivation to work in factories nowadays (Hutzel and Lippert, 2014). Social and family pressure plays an important role on kids. Thus, this pressure can make kids believe that one might study in University to be successful, when not everybody has the capacity to do it. The consequence of this is that there is an absence of people with professional training that want to work in factories.

Further, US taxes and regulatory policies are an important obstacle to reshoring (PWC, 2013). However, states, counties and cities are contending for the best incentives to attract manufacturing and create jobs (Hutzel and Lippert, 2014). However, even though it can be more difficult to reshore than expected, human and environmental rights can make all the difference.

#### **4.7. Human and environmental rights**

Offshoring can be an option for a company to reduce costs. But at what expense and for how long?

If the managers of the companies just look at the numbers, manufacturing abroad can be a good option in the short-term and, in some cases, even in the long-term. The problem is that these optimum conditions in developed countries are normally due to poor human and environment conditions. Human rights are inherent moral principles protected by the international law. As the Universal Declaration of Human Rights (1949) states, "All human beings are born free and equal in dignity and rights". Then, everybody should be safeguard by the international law but, unfortunately, this is not the case.

Quite recently, on 18 December 2014 the BBC broadcasted a report stating that the workers of the plants that assemble the new iPhone 6 in China were working in 12-hour shifts in inhuman conditions. Moreover, two years ago a building in Bangladesh collapsed, thereby causing the death of 300 people and injuring 1000 more. The factory had no fire fighting equipment, emergency exits were closed and employees were ordered to remain on their posts despite the smoke. Every now and then different organizations are

denouncing this abusive situation in developing countries but it seems that nothing changes. The responsibility of many of these accidents lies on governmental negligence and on Western companies, more interested in saving costs than on safety. Moreover, industrial and urban development in China and other developing countries is causing a huge environmental damage to the whole world.

The global environment is in danger. Environmental regulations in China are not as strict as in the Western countries and India seems to be on the same path as well. Repeated environmental regulation is a factor that needs to be considered on the manufacturing location decision too (Tate et al, 2014).

Besides, environment and human rights are linked. A healthy environment is needed to live with dignity and have access to clean food and clean water, for example. At the same time, taking care of human rights helps to preserve the environment.

Therefore, companies need to start considering and believing that not everything is acceptable when choosing the manufacturing location. Even though in the Western countries there is no evidence of such abuses, or at least not in this magnitude, this does not mean that they do not exist. Then, workers and customers also need to react and make aware to injustices, boycotting companies and denouncing them if necessary.

Additionally, all these saved costs avoided by soft regulations will definitely have an impact on the future. All the environmental damage caused would not go unpunished; governments will have to spend lots of money trying to repair it and reverse the situation.

#### **4.8. Summary of literature study**

The reshoring trend has been gaining momentum in western countries, especially in the US (Tavassoli 2014). Still, a western manufacturing renaissance won't reduce China's manufacturing power. China's development has been accompanied by an increasing demand that has created an immense domestic market. In consequence, most multinational companies may choose to adapt their production to serve the Asiatic market being closer to it, instead of just leave the country (BCG, 2011).

So, most of the companies that are bringing manufacturing to the west are just bringing back the production destined to the western markets, rather than all of it (Tavassoli, 2014). Hence, manufacturing serving nonwestern countries will most likely remain abroad. The principal reason is the importance of being close to the new market. However, if production costs were going to increase significantly overseas, some companies would consider the possibility to bring all their manufacturing home.

Different factors have been captured in the strategy of the companies to relocate some of their production back. Taking a look at the Table 2, one can observe that probably the most important factors considered are labor costs, product quality and reducing time to market and customer, both for being closer and for avoiding transportation costs. It is really important to analyze every aspect related to this manufacturing relocation to not miss any important detail.

Unfortunately, there is not an equation that can determine which is the best location to choose for a company. Some companies regretted their offshoring decision, based just on labor costs and without a real exhaustive study. Yet, what is most important is to do a thorough analysis of the company and its environment to avoid making decisions that can be regrettable in the future (Van den Bossche et al, 2014).

Then, the manufacturing location decision cannot be taken just looking at labor costs and choosing the country with the lowest ones. The analysis should be done to the total cost of production, taking into account logistic risks, skilled labor, energy costs and productivity, among others. Low labor costs alone cannot offset the other production and hidden costs. Moreover, the importance and advantages of being close to the market have to be evaluated, such as being able to reduce time to the final customer and having a quick responsiveness to changes in demand.

In conclusion, it is not expected that all industries come back to the western world due the emergence of new and important markets abroad. However, a significant number of companies can return manufacturing to the west in the search for its current advantages. This return can definitely create jobs and growth and recover the western industrial competitiveness.

## **5. Case study: Xylem**

*This case study is based on an interview with Andreas Agnesson, the foundry manager of the manufacturing plant of Xylem in Emmaboda, Sweden. The interview was conducted in May at the factory of the company in Sweden. Even though the subject of study is reshoring manufacturing, this is not exactly a reshoring case because the company did not bring manufacturing back from another country. However, it is related because the company decided to strengthen its home manufacturing plant and thus the Swedish industry, rather than move abroad. The company Xylem invested on a new important machine in its plant with the idea of producing more due to the increasing demand. The purpose of this Case Study is to compare and contrast the theoretical framework with a practical example. To provide a context for the global company, it has to be introduced.*

### **5.1. Introduction of the company**

The company provides wastewater and dewatering pumps, biologic treatments, filtration and disinfection products for municipal and industrial use. Their 12.900 employees working in more than 360 locations on 6 continents create premium application solutions to achieve customer satisfaction. Across different markets Xylem leverages its unique global assets to solve the world's most challenging water problems, see Figure 17.

In the western world we take water for granted, especially cleaned water. The reality, though, is that we lack access to clean water. Consequently, over one billion people in the world don't have access to clean water nowadays. Thus, transportation of water, either clean or dirty, is crucial if we want all the population to have access to it. Unicef has denounced this injustice and has made some shocking discoveries about the topic in the World Health Organization and UNICEF Joint Monitoring Programme (2014). They made a research and concluded that in the whole world more people have a smartphone than access to a toilet. Moreover, they also affirmed that over 50% of the beds in hospitals have patients with a disease because of bad water. This is because in many of the poorest countries, there are not systems to treat wastewater. Xylem, then, is an innovative water technology company that provides products that help transport drinking water and wastewater in the best conditions.

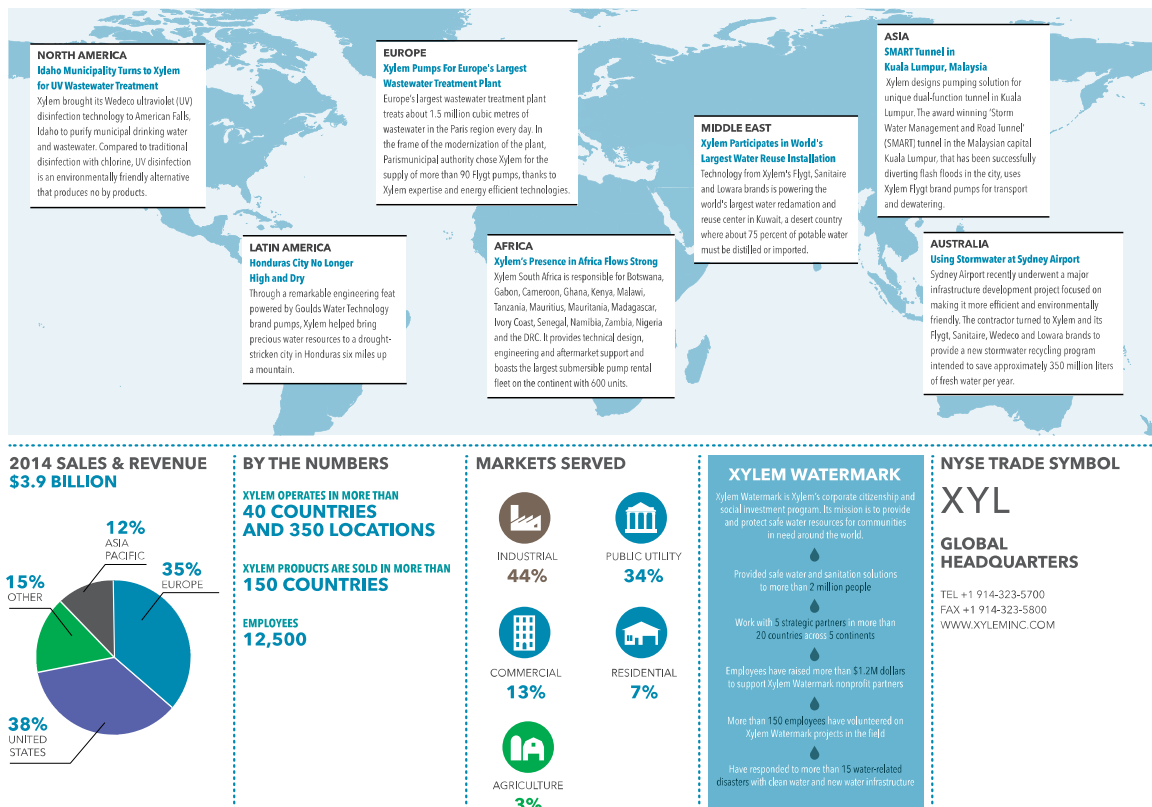


Figure 17. Company overview (<http://www.xyleminc.com/en-us/about-us/where-we-are-located/Pages/default.aspx>)

Although Xylem produces products for the entire water cycle, in Emmaboda they just produce submersible pumps and mixers.

## 5.2. Introduction of the manufacturing plant in Emmaboda

Xylem Water Solution Manufacturing is located in Emmaboda, Sweden. Even though the company has products to manage the water through its whole cycle, in Emmaboda there is just production of submersible pumps and mixers, specifically 160.000 units per year. The factory covers the entire production process, from melting the iron until the assembly of the different parts of the pumps.

In Emmaboda there are 1.100 employees, and they are working in all types of manufacturing for the pumps, from machining to assembly such as painting and package. There is also a foundry to produce metal castings in-house, either castings of grey or hard iron. They produce 10.500 tones per year of grey iron and 650 tones of hard iron, with 119 people working in the foundry. The mission of the foundry is to secure their internal capacity for hard (heavy applications) and grey (standard) iron. Then, of all the machine's

parts, 60% of the castings come from the foundry. The rest of the machine's parts are bought externally, mostly in Europe but also in Asia.

Moreover, despite having customers all over the world, most of them are from the European and North American market. Nowadays, the company also has manufacturing of the same product in China, some assembly in Buenos Aires and service shops all over the world. Furthermore, being flexible is the key to produce what the customer needs.

But flexibility is as important as responsiveness. One of the key points of having a foundry in-house is the shorter lead-time. Lead-time for a pump is critical; waiting a lot can be devastating for people suffering from a flooding for example. Its lead-time for grey iron goes from 7 to 10 working days, and from 10 to 15 days for hard iron. If they go to an external supplier, the lead-time is 30 days for grey and 45 for hard iron. Thus, this is one of their advantages.

In addition, the company believes that hard iron is the future because it has been standardized in the US, so eventually hard iron should become their standard. Hence, the hard iron has an annually increase of 23%, so in this area they can have an advantage compared to other pump competitors with their short lead times and being cost efficient. Moreover, the cost of hard iron is 5 times higher than the cost of grey iron. Nevertheless, the company cannot influence the market and thus the production of iron is done following it, depending always on what the customers want. To give you an idea of what they are manufacturing nowadays, the production of hard iron represents 5% of the total production while the production of grey iron the remaining 95%, but maybe it will increase until 10% in the next years.

Even though the majority of the castings are produced in-house, Xylem has outsourced 40% of their production of castings to Belgium, Southern of Sweden, Turkey, Italy, Austria, and Poland. Belgium is the biggest supplier of castings, while Poland supplies smaller parts that don't fit in their machine. In Turkey they purchase low volume of handmade parts. Yet, every time it comes to a new casting that they don't do, they buy it from someone else first.

They have lots of variations and models of their products, since they try to adapt to what the customer needs. Thereupon, in the factory they have 1200 part numbers, and the part numbers change over 20 times per shift. When doing so, their change over time is 11 minutes long.

Having introduced the company and the manufacturing plant in Emmaboda, the specific investment is explained as follows.

### **5.3. Investment**

After a continuous increase of demand, the molding line of the manufacturing plant was no longer capable of absorbing all the new production. So, as the molding line is the heart of the process the company needed to act quickly.

The decision, then, was to build a new molding line in the summer break. The cost of the machine was 80 MSEK, but some other adjustments to the existing process were done to support the new machine. They needed a machine that could decrease the cycle time from 37 seconds down to 26 seconds per mold, increasing then the production capacity. The big challenge was that they did it in parallel, so they didn't stop the production when building the new machine. As the new machine was bigger, they needed extra space so they extended the building by 1.600 m<sup>2</sup>. Also, they had to open up the roof of the building to put the machine in because it was too big.

As stated, they installed the new machine in parallel while the old one was still running. Over 100 trucks came with materials to build it. At the beginning, some explosions were required in the rocks of the ground because the machine was so heavy that they had to prepare the floor. Afterwards, they assembled and put the machine up mechanically during two weeks. In the third week they did electric installations and in the last and fourth week they did running and testing. Remarkably, the installation lasted just for 4 weeks, even though the supplier said that it normally takes 6 months to set it up. At the end the old machine was thrown. For 3 days, 100 people worked day and night just to take the old machine out.

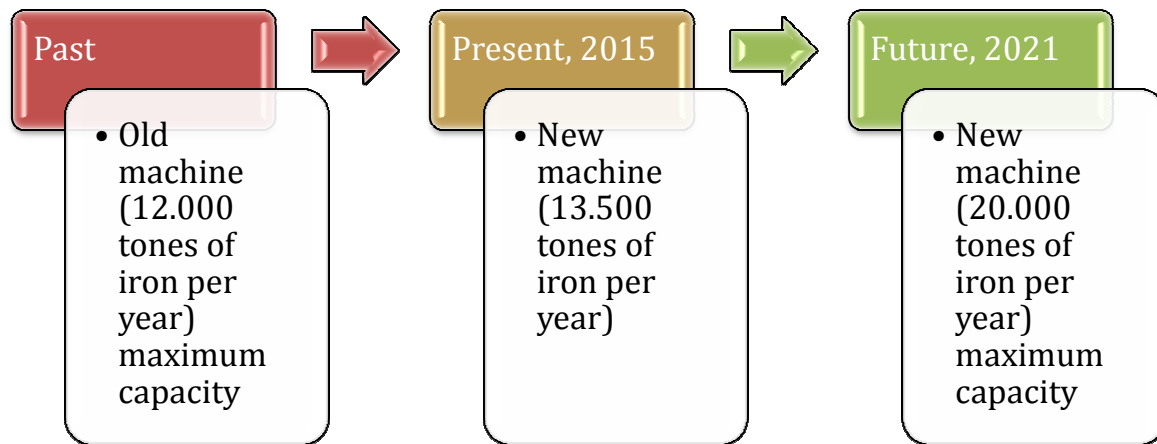
But the foundry is not only the molding line, all the supporting systems with the sand, poring, melting also needed to be adjusted to fit the new machine, so this was a challenging project that involved all the factory.

The new line is 60x18m, twice the size as the old one. In the changing stations they can change pattern, meaning that the change of part number is done outside (the set up time is 11min). Therefore, the changes are done outside while the machine is running.

Hence, the new machine supports the strategy giving more capacity due to the faster cycle time, being also able to produce smaller batches, meaning that they can have shorter lead times and rationalize the costs.

The old machine was 32 years old, with a capacity of 12.000 tones of iron per year. They are now running at a capacity of 13.500 tones per year. Then, it is time to think about the roadmap, how to get to 20.000 tones (maximum capacity of the new machine) per year

doing investments in the other areas to support this big project, see Figure 18. All these other areas have to be properly adjusted to the new machine.



*Figure 18. Evolution of iron production*

For example, the molding boxes are also bigger than the old ones and there are more now in the system, meaning that more and also bigger parts can be produced now. So now, some parts that were purchased to external suppliers can be produced in-house and, consequently, shorten the lead times. Ten part numbers, now bought from suppliers, are planned to get in home with the new investment. The engineers' designers have already found a solution but it is not yet implemented. There is also circulation of molding boxes, which means that they can produce in advance and cast it later by doing circulation outside of the production time, being then more efficient. It's good for the production of strategic parts to have more optimized molding box.

But, to do bigger parts, bigger boxes are needed to fit them, and this also means more sand. As the old sand process is still preserved, there is a capacity constraint in there, being then the bottleneck of the whole process. The advantage, though, is that the company saves sand. Besides, a new sand plant is not really indispensable and it would represent a huge investment.

Moreover, in addition to these new bigger parts, a lot of information processes are monitored. When the iron is melted, from the first second the machine controls the pressure and the change of patterns. This information is used for analysis, for having improvements, for having data if they want to do investments and for maintenance.



After having implemented the machine and the other areas to support it, the focus of the company is to make sure that they have a safe environment in the plant and build the experience in the new machine. It has been there since 8 months now, so they are still learning and creating a stable process to get predictable output. So now their principal objective is to take care of the new investment educating everybody, learning how to get it up and running and increasing in efficiency.

Then, after this investment, the company assumes a strategic growth of 6% per year. This means that in a few years from now the maximum capacity can be totally reached. Actually they reckon they will reach the maximum capacity approximately by 2021. Thus, the machine is not running at its 100% because there are still some things that need to be adjusted. How to run it in an efficient way, parts that are wearing and things that are very hard to predict. Nevertheless, some extra volume can now be produced in-house to run the machine and make use of the higher capacity. In accordance with the foregoing, the investment is definitely a long-term decision. To be precise, this is a 30-year investment.

But moving on to general the topic of the Thesis, some general questions about reshoring are answered as follows.

#### **5.4. General questions about reshoring**

A trend towards reshoring in Europe is perceived as some other foundries are starting to bring manufacturing back home. There was a period where a lot of production went to Asia just because, thinking that everything would be always cheaper. In their case, Xylem has its own manufacturing in China, but the lead-time is an important issue. So, even though the suppliers are in China, they also need 3 weeks for manufacturing and additional 8 weeks on the boat for transportation until Sweden, which means a lot of lost time. Then, having production in Europe is crucial to be competitive, and so is to give impulse to it.

In their case, the company has done the investment to increase production, but they don't expect to hire many more people. The investment is for rationalization and to try to spread out the costs on a bigger volume. Accordingly, there is not a direct relation between producing more and requiring more people. The investment is an enabler to create some jobs but not in big quantities. However, at least these jobs are kept inside Sweden and don't go abroad. Nevertheless, this new trend can be an impetus to create some new jobs and reverse the European crisis. But, why was an interesting opportunity to invest in Sweden?

#### **5.5. Investment & the Company**

Investing in Sweden was an attractive option for the company because 90% of what they do is there today, meaning that they already have the knowledge, a good supply chain and a lot

of know-how. It is easier to invest in the Swedish plant compared to do it in a place where they have never been before, hiring new people and teaching them. It is also in line with the manufacturing strategy of having vertical integration and shortens the lead times.

So, one might think why did they choose this specific location?

It all started in 1901; hence it is a long tradition. The story tells that there was a lot of glass production in the area and they needed molds for the glasses. A blacksmith working there was good at doing these molds and a constructor from Stockholm contacted him through a job advertisement in the Swedish newspaper because he needed help to build one of his pumps. Then, the blacksmith answered the note in the newspaper and they started to produce pumps.

Since the beginning of the production, the location of the plant has not changed. The plant has been expanding a lot and the company has finally realized that it makes no sense to move to another location, as it would suppose an uncertain huge project. In Emmaboda, they already have all the installation, skilled people and knowledge necessary. Then, it is not worth it to move some kilometers away. However, if they decided to move to another location, they would go abroad in the search of much lower costs, for example in Southern Europe. The reason is because the main market is Europe, so it would be preferable to locate it in Europe instead of another continent.

Going forward and studying the topic more closely, the factors that brought the company to invest in its plant are the following.

## **5.6. Investment factors**

There are different factors that a company takes into consideration when deciding to invest in its manufacturing plant. First of all labor costs always play an important role.

### **5.6.1. Labor costs**

One of the most important factors when reshoring manufacturing or invest in a plant is the cost of labor. The decision to invest in Sweden, though, was made by the management group. The managers of the factory made a proposal to the board explaining their project and saying that there was an opportunity to invest in a new machine. Then, the management group came to the factory and realized the great investing opportunity to strengthen its vertical integration. So, even though the Swedish labor costs are higher than in lots of other countries, the board accepted to invest in Sweden. The next important reason could be automation.

### **5.6.2. Automation**

Another important factor to bring manufacturing back is the use of more automated machines. However, the new machine does exactly the same operations as the last one, but just with a higher capacity. Notwithstanding, there might be more automated machines in some parts of the process in the future. So, the next factor that comes to mind after automation is workers' skills.

### **5.6.3. Skilled labor**

It is not easy to find skilled people in Sweden, at least foundry workers. Foundry people with experience are scarce. It might probably be because of poor quality education and also because young people doesn't want to work on this type of jobs anymore. People are afraid because of the safety and because of the hard work. The working conditions, such as noise and dirt, can make people give up and decide to work somewhere else. Besides, having a different currency can also play an important role.

### **5.6.4. Currency exchange**

Currency exchange is very important when investing because exchange rates are in constant change. You can have come to an agreement long before the payment, but when it comes to pay, the price could be 50% down or up. Then, it is a complete lottery; sometimes it can be in your favor but sometimes not. As an example, the Swedish currency has gone 25% weak in respect of the dollar in just one year and 4% in respect of the euro. The currency situation, then, is not ideal. But what about the Swedish tax structure?

### **5.6.5. Tax structure**

When compared to other countries, taxes in Sweden are certainly higher and they affect the final costs. But what is even a bigger disadvantage for them are government subsidies from other countries. For instance, a Polish foundry recently got money from the European Union (50% of the investment, of which 80% came from the Polish Government) to build a new foundry. Subsidies in Poland and some other regions pop up every now and then. The government wanted to have an industrial area with a foundry, so the Polish company bought the same machine that Xylem installed in Sweden.

How can Sweden or another country compete with that? As mentioned above taxes are higher in Sweden, but what is even worse is that other countries help companies in their investments while Xylem had to count every single Swedish krona invested in the project. Of course, it would have been so much easier if they had not had to worry so much about the

money. However, Sweden has the advantage of being a more stable country and a strategic location for the European market.

#### **5.6.6. Reduce time to market / Logistics**

As a concept, locating manufacturing close to the end customer saves working capital in inventory. But, where is close to the customer when the whole world is your customer? Hence, it is clearly important to be close but there is a choice to make.

In Emmaboda they have customers all over the world. To be exact, the proportions are as follows: in Europe (60%), in North America (30%) and in South America, Asia and Australia (10%). Europe is the biggest customer as a region and the US as a country. Accordingly, it is still possible to supply the US with products manufactured in Europe. In Asia, Xylem is now developing fast (with their plant in China they are able to support this growth, for 20 years). Yet, being closer to the customer is also important.

#### **5.6.7. Proximity to customer**

Being close to the customer also increases responsiveness to changes in demand. Emmaboda is pretty close today with all the service branches. The challenge is to take the information from the service guy, who is working in Buenos Aires. He has to talk to the manager in Brazil, and then the manager has to talk to his boss in Latin America, who then talks to the operation manager and finally comes back to Mr. Agnesson, the foundry manager. The information always arrives, but there are lots of steps and filters in between. Besides, the energy situation can be also decisive.

#### **5.6.8. Energy costs**

Other foundry managers from developing countries complain about the energy situation. For instance, in India, electricity is not something that you take for granted. You have a day in the week or at least some hours where you get shut down and can't get electricity. Energy prices in Sweden are high compared to many other countries but at least there is stability and production of electricity all the time. Then, this can also affect quality.

#### **5.6.9. Quality**

With the new machine, the company expects a quality improvement in its new products. With the flexible toolbox they have more options to do good molds. However, it will take some time to get a stable process, learn the new machine and evaluate all the new functions.

So, is the quality affected by the manufacturing location? Initially, if the same machine was going to be set up in Poland, with new and inexperienced workers, the production would not be as efficient as in the plant of Sweden, because in Emmaboda they already have the knowledge of the parts and the process. However, after some time in Poland they would reach the same level of production. So, the production in Poland in the short run would not be the same but in the long run (10-15 years) it would reach the same level. Notwithstanding, locate a manufacturing plant in a developing country can cause dangerous consequence, such as theft of intellectual property.

#### **5.6.10. Intellectual property**

In the company no one has noticed any case about possible misappropriations of intellectual property, they have never had problems with that. Nevertheless, there were more regulations when the company was a part of ITT (3 years ago) for security reasons, as ITT is an American company that sells military weapons. Furthermore, flexibility is essential for the company.

#### **5.6.11. Flexibility / Innovation**

Now, with the new machine, the company has more flexibility for product innovation. Definitely, they can produce hard iron next to grey iron, so there is a bigger chance of doing a mix. Further, they have the flexibility to grow in both irons, adapt to shorter lead times and run smaller batches due to the changing stations. Yet, it is always important to be close to your suppliers.

#### **5.6.12. Supplier's location**

The key suppliers of the company are located in Sweden. For Xylem, it is crucial to have its key suppliers close by, to reduce transportation costs and have a better communication. Then, Xylem buys the scrap from Kalmar, the pig iron from a region in Sweden, the sand from Baskarp and the water comes from the municipality. The quick responsiveness when they have to react to some setback is also crucial, and being near to its suppliers helps to manage the situation in a better and quicker way. The environmental side is important too, as they don't need to transport from long distances. Finally, the last important factor is the brand image.

#### **5.6.13. Image**

The image is important for the customer. Customers are willing to pay more for a product "Made in America" or "Made in Europe" rather than a product "Made in China", for example. There are countries where they have discussions if they should be sourced from

Chinese manufacturers. In their case, some customers don't accept products "Made in China", they should be "Made in Sweden".

Having analyzed the company, the specific investment and all the different important factors for the company to invest in Sweden, the conclusions are as follows.

## **5.7. Conclusions**

### **5.7.1. Investment**

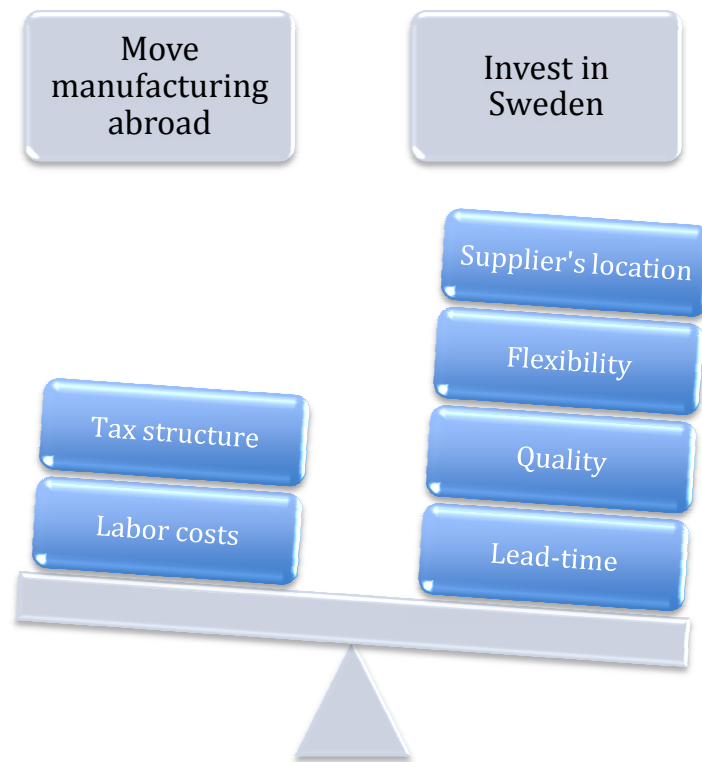
With the new machine, compared to the 30-year-old one, there will be a more stable process. So, after time, a more stable and predictable process is expected and, thus, more control. By having more capacity in the machine, there is more muscle to take care of the increasing demand in a better way. The old machine was running in full capacity, so it was obviously impossible to produce more. Now, by hiring some people they can run extra shifts and produce more.

Not all was plain sailing, however. This was a remarkably complex and challenging project. Anyway, at least all the board believed on the investment so they had their support in every moment.

However, with the benefit of hindsight, it was a good experience. There was a lot of time and effort put into it, a lot of arguments, fighting, struggles and negotiations but at the end you can see the success when the machine is running.

Eventually, they have the confidence that they will be there for a while. The board believes in them but they have to show that it was the right investment to do and continue to build credibility.

Even though some factors analyzed may seem that work against investing in Sweden, the company decided to venture strongly into the new project. The key factors that tipped the balance in favor of investing in Sweden are illustrated in the Figure 19.



*Figure 19. Key factors for investing in Sweden*

Furthermore, the conclusions about reshoring are evaluated below.

### **5.7.2. Reshoring**

The “offshoring wave” is over and companies are bringing manufacturing back, after realizing that maybe it was not the best option to go abroad. Some years ago it was so easy to compare price lists and decide to go to China just looking at them, but they forgot all the other hidden costs involved. For some manufacturing, though, it is probably better to locate the production, for example, in China. For electronic products such as computers or TVs, it would be difficult to produce them in Sweden today. This is because the knowledge is now in Asia, so there would probably be a better chance to success producing there. On the other hand, for other products such as pumps for the European market, the best option is to go back and have the majority of the production in Europe.

Having a look at our specific Case Study, if the company wants to purchase iron from China, it will take 11 weeks to arrive to Sweden (3 weeks for production plus 8 for transportation). But it’s not just about the time, in the boat the iron turns red and gets rust. So, the iron needs to be treated in advance to avoid these problems or, otherwise, be cleaned when it arrives to Sweden, meaning that additional cost and lead-time is added.

In conclusion, depending on the product, some production should go abroad but some should stay home. Focusing on pumps, one can say that the more standardized ones can be

produced in Asia while the more complex have to be produced in Sweden. Finally, the most interesting thing about evaluating a Case Study is to compare it with the previous literature study.

### **5.8. Summary/Comparison of Case Study and Literature Review**

Even though the case study is not exactly a case of reshoring manufacturing, the concept is similar. The company made an important investment in Sweden plant instead of moving production abroad. Then, the decision was to reinforce its plant and rely on its industrial potential.

What is more, it is a long-term decision. The company expects a favorable situation in the next years. This means that production costs in Sweden are and will be competitive internationally. Certainly, no one can predict this assertion but everything suggests that Sweden is heading in that good direction.

If the factors in the literature study are considered, one can draw the follow conclusions. The most important aspects for the company to invest in Sweden were the quality of the products, the short production lead-time, flexibility and the supplier's location.

Quality is crucial to survive on the market because the customers demand the best products. Processes are not easy to transfer and just the most standardized products could go abroad. Furthermore, as it is pointed out in the case study, there are customers that do not accept products made in China because of quality issues.

Moreover, a problem in a supplier's product can cause serious complications in manufacturing. For Xylem it is essential to have its suppliers nearby, not just to reduce transportation costs but also to deal with possible issues in a faster and more effective way. Besides, the short lead-time is decisive for its success.

Making the supply chain faster and reducing time to market creates a strategic advantage for the company. The fact that its lead-time is substantially shorter than the one of a possible supplier plays in its favor. Moreover, long distances also contribute to costly supply chain coordination activities and a slower response.

Finally, the new machine will provide more flexibility to innovate in both irons and to produce bigger parts than before. In the neighboring country of Denmark, one of the main drivers for reshoring manufacturing has been having manufacturing close to R&D to easily innovate (Arlbjorn and Mikkelsen, 2014). Accordingly, long distances between the manufacturing plant and the R&D Department may negatively affect product innovation.



## 6. Conclusions

### 6.1. General

The debate over offshoring and reshoring is on the table and the evidence of their effects is still mixed and ambiguous. As the great British economist Alfred Marshall (1842-1924) once said, *“all short statements about economics, with the possible exception of this, are false”*. Then, there are no absolute truths and unquestionable conclusions, but there are tendencies and approximations to reality. However, what is clear is that reshoring is receiving increasing attention in the popular press and even in the political discourse. As an example, the president of the United States Barack Obama hosted a forum in the White House about reshoring on January 11, 2012 (Tate et al, 2014).

Thus, even though some factors may act in favor of reshoring and others against it, the first conclusion is that the manufacturing location decision has to be analyzed in depth, taking into account both production and hidden costs. There are always risks when choosing a specific location, but if all the different manufacturing location factors have been carefully considered and revised, these risks can be minimized. Then, this deep analysis can help companies to choose the best option and avoid erroneous decisions. The option for some of them can be bringing manufacturing back home, so we can be in front of a Western manufacturing renaissance.

I believe that the offshoring trend made the western countries weaker after the global crisis, and now there is a need for creating jobs to leave this situation behind. Most of the European countries are suffering from unemployment rates never seen before and, what is worse, it seems that there is no light at the end of the tunnel or, if there is some, it is not shining as brightly as it did some years ago. However, the second conclusion is that not every industrial sector will reshore, nor in the same way and to the same extent. Apparently, reshoring is gaining momentum nowadays because the macroeconomic factors are on its side. However, these macroeconomic factors are always unstable and no one can predict how they will exactly evolve. Accordingly, no clear conclusion can be drawn in the light of the above mentioned.

Nevertheless, it seems that we are in front of a globalization of production, as companies are continuing to internationalize their activities. Western companies that went abroad to produce cheaper, now realize that a huge new market has opened. The wage growth in China is a clear negative aspect in terms of production costs for companies installed there. However, this wage growth also increases the purchasing power of Chinese people, which means that the internal Chinese demand grows substantially. Then, if the internal Chinese demand increases, an interesting market opportunity is created. Therefore, the reshoring factors point that some production will come back to the western countries to satisfy its

demand and some may remain abroad to satisfy other markets. So, there is hope for a possible Western manufacturing renaissance, even though not all the production will come back. Moreover, not all the industries will reshore the same way. As mentioned above, some western industrial commons are atrophied and will be difficult to restore them, while some Asiatic industrial commons and its respective supply chains are gaining strength.

So, it absolutely important to keep on studying the reshoring trend to find more information of it and be able to draw new possible conclusions.

## **6.2. Suggestions for future study**

As the reshoring trend is a quite new area of interest, there is not much literature review available, and even less in Europe. The first potential research aspect would be to further study the European situation. However, in the last few years the popular press has started to be interested in this new phenomenon.

Another suggestion for future study would be to try to differentiate between firm sizes and industry as globalization strategies can change (Arlbjorn and Mikkelsen, 2014). Depending on the type of industry as also depending on the size of the companies, tendencies are different. Then, one should not try to generalize when studying the reshoring phenomenon.

Another important aspect to consider is the effect of the global world crisis in the manufacturing location decision. It would be interesting to analyze the progression of the offshoring and reshoring decision in relation with the crisis and draw conclusions from the possible changes of the global macro environment and the different industries.

It might be also interesting to explore the influence of automation. The question is, can automation maintain jobs or it will destroy them if the manufacturing comes back to the West? A study made by (Arlbjorn et al, 2013) affirms that 47% of Danish companies that outsourced production during the previous five years realized that jobs to a “very high degree/high degree” could be maintained through automation (Arlbjorn and Mikkelsen, 2014).

Finally, it would be interesting to examine how companies learn from their bad reshoring/offshoring decisions (Kinkel, 2014) and how these decisions affect the future location decision. Moreover, another important aspect to consider is the link between companies from the same industrial sector and study how these companies are influenced by their competitors in the manufacturing location decision.

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