

MANUFACTURING COSTS IN CHINA AND IMPLICATIONS FOR US COMPANIES



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1- Introduction

The world is a dynamic system that changes constantly: facts that were true yesterday may not be tomorrow, and the world of industry and trade is not an exception. During the last years, many social and economic shifts have occurred around the globe and they are reshaping the manufacturing and the supply chains. Among all these shifts, China's increase of manufacturing costs is probably one of the most critical ones, given the exceptional importance of the country as a producer.

For decades, companies from developed and industrialized areas have moved their production to China seeking the low manufacturing costs and taking advantage of the rise of industrialization taking place in the Asian giant. However, nowadays the conditions are not as favorable and the evolution of other regions is jeopardizing the competitiveness of the People's Republic of China and having a huge impact on the statement of profit and loss of thousands of companies. Many of the affected corporations are redefining their strategy and building new capacity in other regions, but it is extremely complex and difficult to know in advance what to do in order to remain competitive for the coming years.

From the point of view of a student familiar with the supply chain management and more specifically with the global supply chains, the phenomenon of China's industrialization can only be praised because of how effective it proved to be. However, it seems that this golden age of Chinese manufacturing is coming to an end; at least in the way it is now. In this moment we are facing an uncertain situation and it is fascinating the wide variety of options, and even more fascinating the impact that the strategic decisions to adapt to the new reality will have on the companies. As an Industrial Engineer, I decided to work on this project because I am convinced that it is one of the biggest challenges affecting the Supply

Chain and a good understanding of the whole problem will become a great tool for my career.

1.1- Purpose Statement

The purpose of this project is to identify the main causes of the rise of manufacturing costs in China and analyze the best alternatives for US companies that are suffering it.

Furthermore, the main objectives of the research are:

1. Performing a research about the current situation of manufacturing in China and about the facts that led to this reality.
2. Understanding the challenge of the affected US companies and identify the most suitable options for their future.
3. Acquiring experience within supply chain by collaborating with a US corporation and dealing with a real case.

2- Manufacturing in China

The current challenging situation for the manufacturing in China is depicted as a very complex problem that will reshape the industrial world. However, China has not always been the manufacturing hub of the world. From the beginning of the industrialization, the shifts that have taken place in China have been absolutely decisive to influence the posterior development. It is therefore necessary to know and understand the path that China walked to arrive to where it is now. In this chapter, it is briefly summarized the rise of China as a main player and it is also described the current situation.

2.1- History

The surge of China as the giant that we know is one of the most prolific examples of the development and change of a country. This successful story explains a rapid economic growth based on a new industry that has rose out of extreme poverty up to 500 million people and allowed a previously poor country to be the second largest economy in the world. At the same time, the huge impact of China on the US economy must be remarked since the Asian region is the second trading partner of the US and is the home of an extensive list of American companies that take advantage of the low producing costs to export the goods manufactured in China or to sell their products in the growing Chinese market.

After the Chinese Civil War ended in 1949, the Communist Party of China took control of Mainland China. In that same year, Mao Zedong proclaimed the People's Republic of China and established the communism. During the next period, all the activity and economy of the country was centrally controlled by the state, which was in charge of directing and

controlling the production of the country with the aim of being self-sustainable. During the 60s and 70s the government undertook very important investments in human and physical capital in order to aid the industrialization of the country. However, as a closed communist country, the private companies and foreign investment were very restricted. China had lower standards of living than other developing countries and after the death of Mao, and the government decided to reform the economy to improve them.

In 1979 numerous economic reforms were launched, what is regarded as the base of the posterior success. The reforms established four coastal development zones with special conditions to attract foreign investment and to increase the exports. At the same time, a deep decentralization took place, with local governments in charge of their own business and the free market principles beginning to rule the activities rather than the central government. The Chinese began being encouraged to launch businesses and the barriers and controls were progressively eliminated, what translated into a liberalization of trade.

Since the implementation of the reforms, the foreign investors began regarding China as a promising opportunity and the country went through a fast industrialization and the economy grew steadily. It is often pointed that this rapid development was possible because of the large-scale capital investment allowed by the new foreign investors but also by the Chinese, who had been saving money during the time of Mao. In addition, the new measures to be open to the world and liberalizing the trade had an extremely positive impact on China's productivity: the capitalist strategy granted a better allocation of resources seeking the competitiveness, the new foreign technologies that arrived to China were also very significant to develop the industry, and farmers from inland provinces started moving to the coast to increase their income.

The large amount of population available to work in the nascent industry and the low standards of life ensured the availability of workforce at very cheap costs, the pillar of the competitive advantage of China. China progressively became the favorite option for developed countries that tried to have cheaper costs through delocalization. The trade and foreign investment reforms were the first step leading to a boom beginning in the 90s. The fast rise of foreign investment was the key to capitalize the industry and China acquired such an important weight that made it become the second largest recipient of Foreign Direct Investment in the whole globe, right behind of the US.

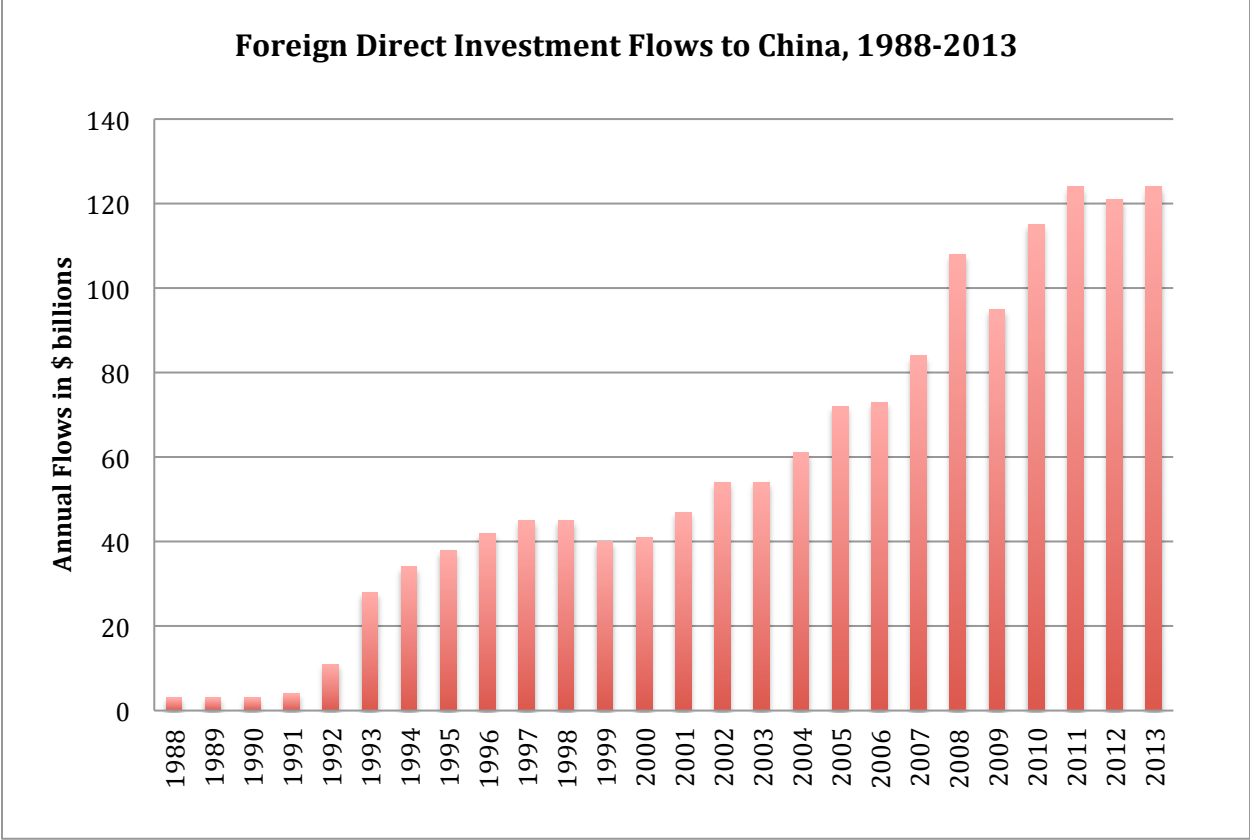


Chart 1: Foreign Direct Investment Flows to China

The foreign companies settling in China moved there to manufacture and export the goods to other consuming countries, and at the same time China became an assembler of some

products coming from abroad. As a consequence, the People’s Republic saw how the trading activities boomed, not only because of the exports but also because of the raw material and components imports. With the new manufacturing and trading activities, the economy of China experienced an incredible growth year after year, averaging more than a 10% after the glorious reforms of 1979. At the beginning of the 21st century, the economy consolidated and kept on expanding, but the global financial crisis starting in 2007 implied a economic slowdown in China: since the countries importing from China struggled, the trading activities were impacted. This last financial and global crisis has triggered decisive changes in Europe and America, some of the most influent partners of China, and the new situation along with the higher production costs in China are driving the country to a different economic model more focused on the Chinese market and less reliant on exports.



Chart 2: China's GDP growth

2.2- Current Situation Overview

After years of continued industrial, social and economic development, the future of China seems uncertain. The GDP growth shown in the previous chart made China become the second largest economy in the world after the US, with a GDP of more than \$10 trillions, but the growth promoted by the current model is slowing down. People's Republic of China is the most populous country, and for this reason, even with such remarkable numbers, the GDP per capita is still far away from the levels of the most developed countries, being less than 20% of US figures. It is also true that the price levels of China are also way lower, what gives to the Chinese, specifically to the surging middle class, a higher purchasing power parity than what comparisons with GDP per capita indicate.

The main strength of Chinese industry is found on the labor-intensive manufacturing, with assembling and low value-added operations on top of the ranking. As an importer, the People's Republic is buying many of the high technology parts and components but also materials and combustibles due to the huge consumption of the country.

China's reality has changed dramatically for the last decades and had some very positive results for the economy, but the current situation is not as favorable for exporting. The higher costs that came along with the growth of the economy are threatening China's success, and the government has started to take some measures to aid the evolution of the country and the change of model.

Despite of the numerous reforms undertaken by the government, China has not completely transitioned to a market economy. The state has allowed the free market forces in some sectors to aid the economy, but the role of the government is still capital. This model has brought growth but has also created important problems: over-reliance on exporting,

inefficiencies due to government policies, the alarming pollution and the income inequality throughout the regions. Overall, China is facing some important challenges to become a completely developed country:

- **Intervention of the Government:** A large percentage of the most important companies are owned by the state, which prevents the competition. This lack of market competition implies the underutilization of resources, not allowing the industry to perform at the optimal level. In addition, these companies are relying on loans controlled by the government to ensure the capital for the state-owned companies. As a result, the banking system is giving money at very low rates to not reliable companies in order to stimulate the economy, what is increasing the debt of the country.

Moreover, the intervention of the government trying to regulate the currency exchange, and lowering artificially and subsidizing the costs to promote certain industries have been the root cause of over-capacity and the slow development of the sector of services.

- **Excessive dependence on Exporting and Fixed Investment:** With the aim of helping the corporations and controlling the banking, China focuses too much on financing the companies at the expense of the Chinese households. Empowering the companies this way made them able to be very competitive exporters, but has not been favorable for local consumption. If the government stops these policies, the companies will struggle but it should help the consumption.

Looking at the future and as it is explained in next chapters, the competition around the world is extremely fierce. China's current size is no longer compatible with the old model.

The government has started to reform the laws to change from the exporting model to a local consuming structure, what is likely to jeopardize the suitability of the country as the home of American manufacturing facilities. Of course, many things will have to change and the supply chain world will be highly affected by these shifts.

3-Factors affecting the Chinese manufacturing cost

After introducing the history and evolution of China that made it become the leading manufacturer, it is easier to understand how the country succeeded and became a main player. However, the Chinese industry is no longer in that point desired by foreign companies looking for the best prices. In this chapter I point and discuss the main factors that have been influencing the manufacturing costs, using qualitative and quantitative information to explain them and prove their consequences.

3.1- Labor Costs

Among the list of factors influencing the rise of final costs, the evolution of labor costs is pointed as the most critical. The cheap labor costs along with the available workforce used to be the country's biggest advantage, and the progressive loss of this advantage is decisively harming the industry.

From the beginning of the industrial revolution and the subsequent economic growth of the country, the labor costs rose in China at a moderated pace until the 2000 decade. China became a member of the World Trade Organization (WTO) in 2001, a fact that accelerated the production and exports of the country, developing the economy and having the private sector creating employment opportunities. The increase of the production economy entailed a boom on the manufacturing wages, especially after 2004:

- Standards of living are rising quickly so the salary rates have been increased consequently. Along with the economy growth, China has a new middle-class growing year after year that is boosting the consumption and demand of the Chinese market but also requiring higher wages.

· Available labor force is not as extended as it was in the past in the manufacturing provinces of China mainly because of two demographic shifts:

1. The population is aging and the country is moving towards a new scenario where the excess of labor supply will not exist anymore. The one-child policy along with other regulations to control the demography has impacted the age distribution: percentage of people of 60-and-above years old is forecasted to increase from a 12% in 2010 to a 34% in 2050.

2. After decades of rural migration to industrial areas that were employing low-cost workers, the amount of people available to move and provide new workforce has become scarcer, as it is shown in the chart 3.

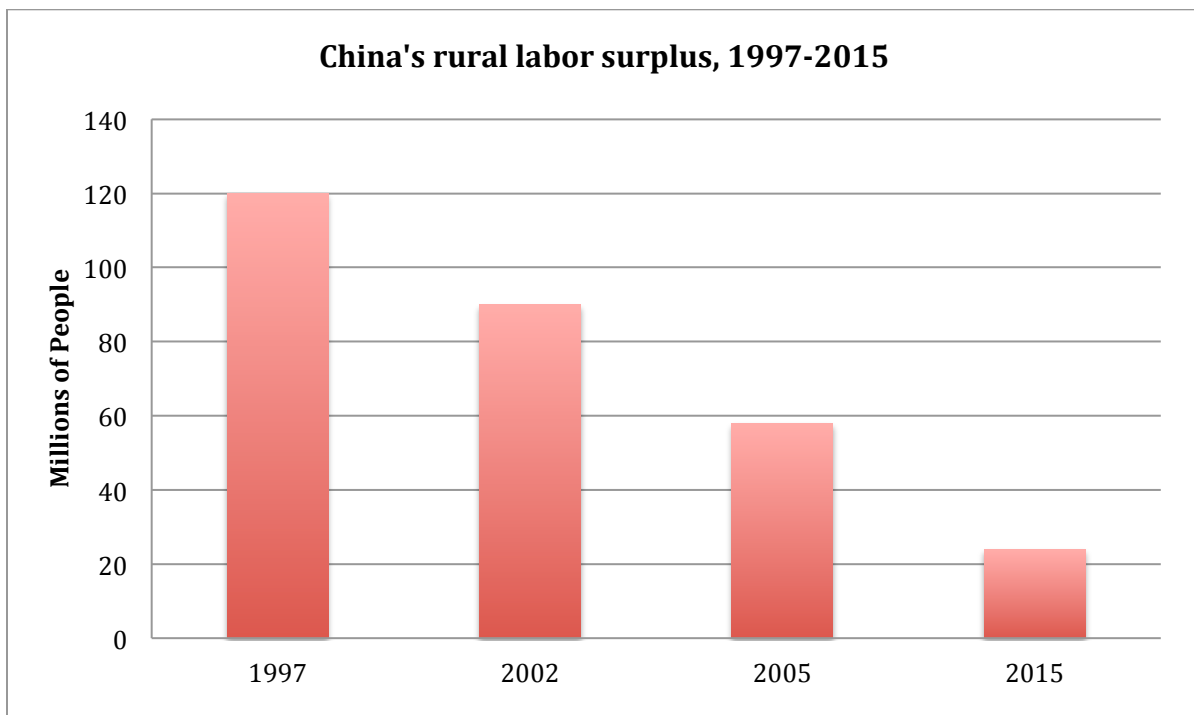


Chart 3: China's rural labor surplus

As a consequence of the previously stated facts, the average Chinese salaries have kept on growing more than a yearly 10% and are expected to continue rising at an average 12%

until 2020. When comparing this trend with other countries like US where the average wages are rising approximately a 2% a year, it's easy to understand why the cost difference is becoming smaller. In the next future, with the current growth and salary rates, China is still expected to remain more labor cost-competitive than other manufacturers like US, South Korea or Brazil. However, compared with Asian cheap-labor countries like India and Vietnam, where the wages are already lower than in China, the gap will become even bigger and will be a threat for the currently most important manufacturer. At this point, the average salary level of China is more than a 50% higher than in Mexico and more than a 160% higher than in Vietnam.

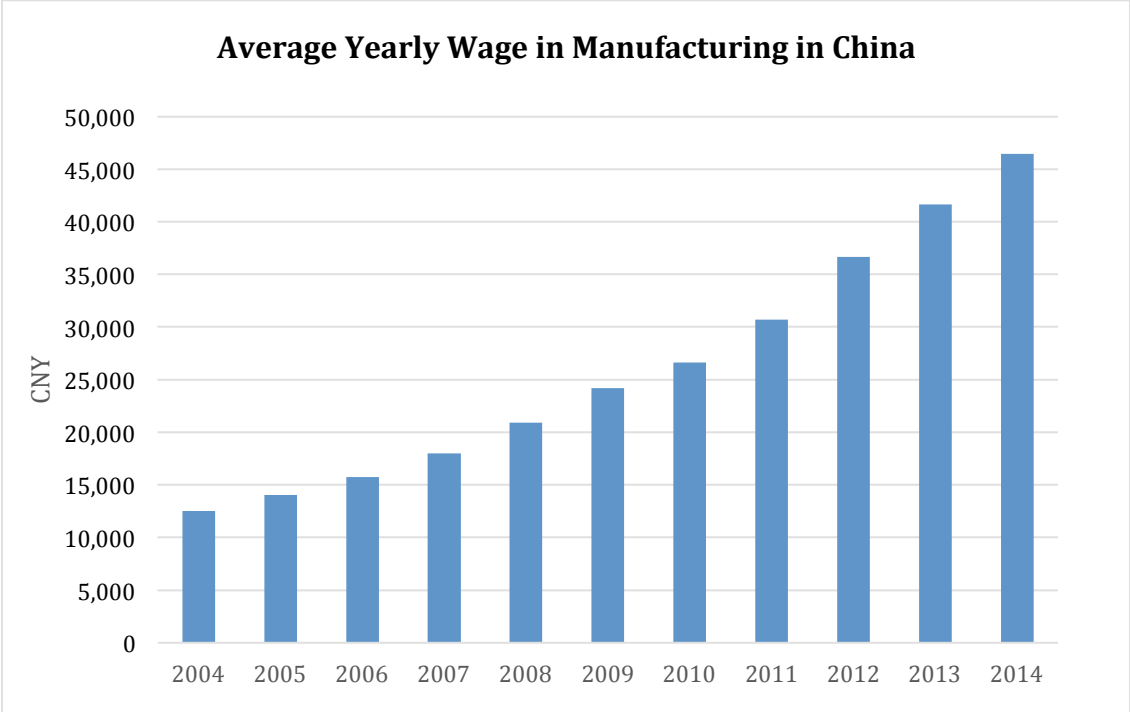


Chart 4: Average Yearly Wage in Manufacturing in China

Nevertheless, the situation in the country as a whole is far from being uniform across the many provinces, an advantage that can help the manufacturing industry. The best-paid manufacturing employees are in the coastal areas, especially next to the cities of

Guangdong, Shanghai and Beijing. This can be explained because there is a greater concentration of industries due to the ease of shipping the products directly in the main harbors. Moreover, the huge internal disparity will offer in the future a “temporary” solution to sustain the cost-competitiveness of China, since provinces with lower labor costs like Jiangxi or Henan, that also have a decent infrastructure and large labor pools will provide lower salary levels.

3.2- Currency Rates

China’s economy has grown faster than any other major economy during the last decades and one effect that can be easily seen is the appreciation of the Chinese currency, the Chinese Yuan (CNY). The Yuan has kept on climbing against the US dollar with a total appreciation of more than 30% since 2004, a trend that outstrips the performance of any other important currency. Even if the Yuan is controlled, the government allowed it to appreciate at an annual 4%.

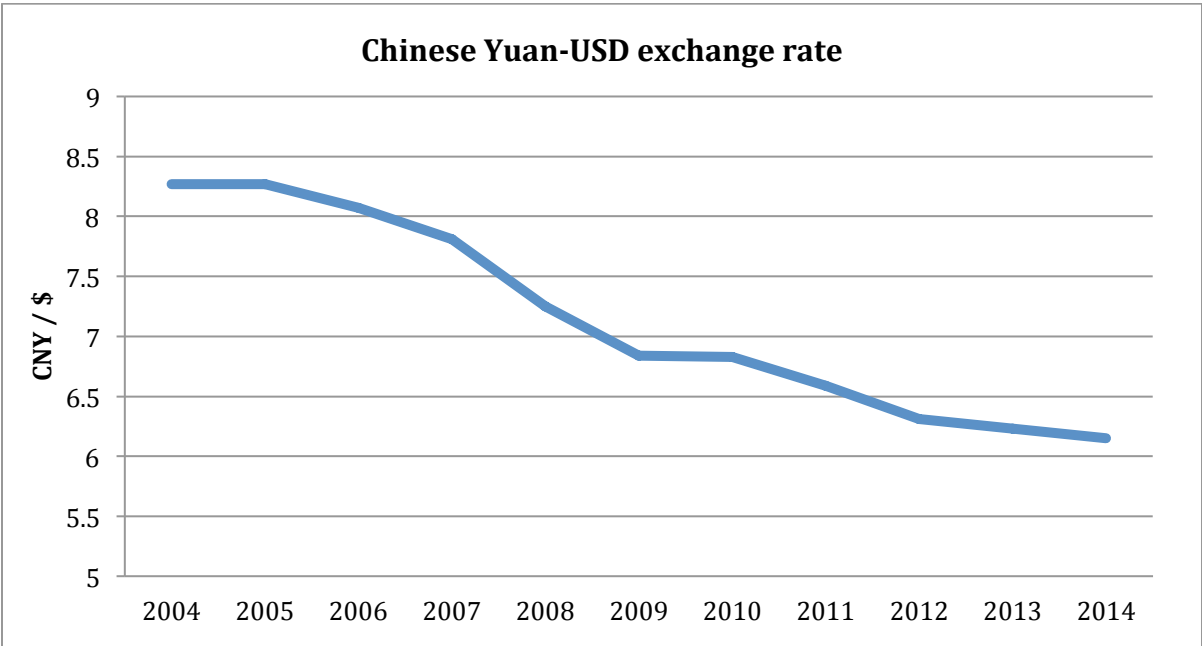


Chart 5: Chinese Yuan- USD exchange rate

China's currency had long been undervalued after Beijing devalued the Yuan by a third in 1993 and fixed the exchange rate, offering extremely competitive costs to the trading partners. The American manufacturers suffered the cheap Yuan impact on their trade balances and employment rates. However, in 2005 China started to allow the appreciation of its currency. The Chinese Yuan has since increased its value, giving more buying power to the Chinese but also eroding China's competitiveness of the export-oriented industry. The companies importing from China have suffered an important increase on costs, mainly in America and Europe, having a worst effect on the Eurozone because of the recent depreciation of the Euro, what has already implied an important reduction on the imported quantities.

A good example to understand the implications of the currency exchange changes during the last decade can be observed if we look at the salaries. As mentioned before, the wages have kept on increasing at a fast pace. This fast pace is even faster if we look at the wages in USD, the costs that the importers from other countries have to pay:

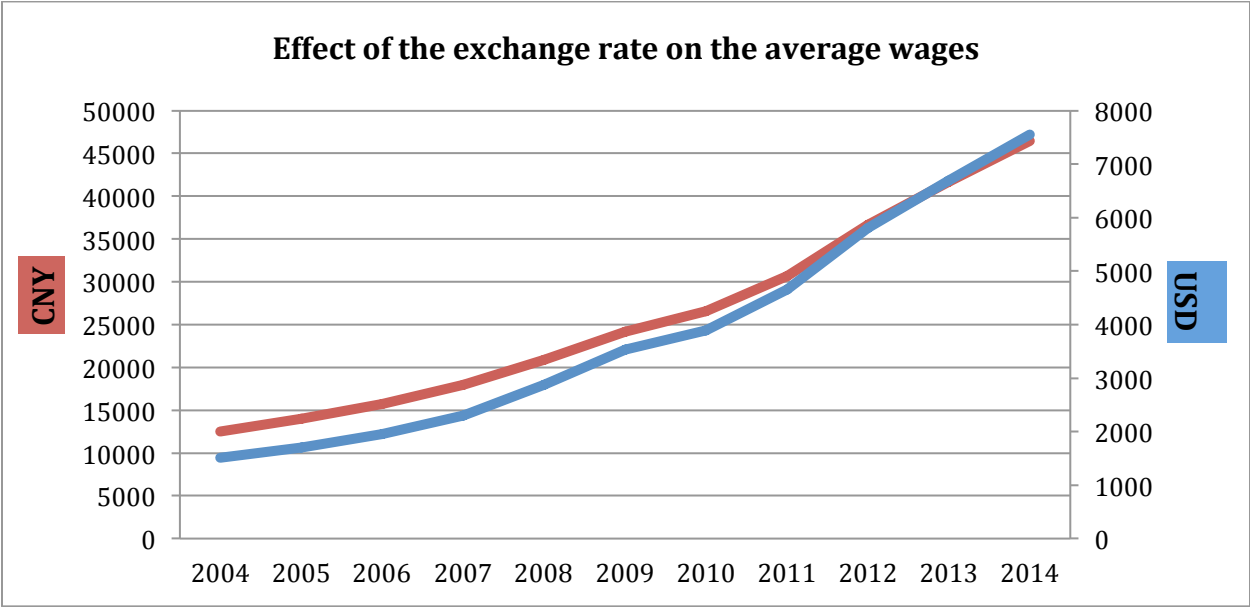


Chart 6: Effect of the exchange rate on the average wages

There are many factors that are making the production costs in China increase year after year, including political and social shifts. At the same time, as it can be inferred from the chart, the Chinese Yuan appreciation is just multiplying the final effect of these factors, having a negative impact on the final price that foreign trading partners have to pay.

The ever-growing trend of the CNY changed in 2014, when the exchange rate got stuck, fluctuating between 6.12 and 6.25 CNY/\$. At this point, the Yuan is considered overvalued and it is not likely to retake the appreciating tendency again. Since exports account for a quarter of the total GDP, the strength of the Yuan has been painful, but it is also implying a growing international presence demonstrated by the meteoric rise of the Yuan as a payment currency for payments and trade, especially between Mainland China and emerging markets despite the capital controls that are trying to constrain the use of CNY in global trade.

Moreover, the Yuan's appreciation might be supposed to benefit the imports of key materials and components and provide cheaper suppliers sourced abroad. However, most of the Chinese manufacturers keep on purchasing from local suppliers or authorized agents and distributors. Therefore, balancing the effects of the strong currency, it is hurting the Chinese manufacturers.

3.3- Productivity

During last decades, the main drivers of growth of the GDP were the increase of working labor, the increase of productivity and the increase of capital (the most important one with almost two-thirds of the total GDP growth). However, with the current economic and demographic shifts, if China wants to ensure the future growth, the critical factor will be

the productivity. Moreover, it is concretely the comparatively low productivity one of the main reasons why foreign companies are losing appeal towards the Chinese industry.

Between 1990 and 2010, the yearly average growth of productivity rate was 2.8%, way higher than in most countries in the world (for example US experienced an average of 0.5%). Despite of the positive growth statistics, the absolute figures show a reality that is way behind of praising the Chinese productivity:

- In 2012, the average labor productivity per worker was \$68.374 in the US, \$44.851 in Japan and only \$15.250 in China.

The low productivity compared to main competitors, along with other facts threatens the competitiveness of China, particularly in some pivotal sectors like high-tech, pharmaceuticals and telecommunications. This situation can be explained mainly because of three facts:

- Lack of competition: The government regulations don't allow free investment and competition to the foreign and private firms in some sectors. Differently than what happens in other markets such as US, where the fierce competition encourages the productivity rise, the limited role of private companies has harmed the local industry.
- Misallocation of R&D expenditure: While the increase of resources invested has been constant and China is already the second on the total R&D spending after US, the utility of the R&D centers has proven not to be as successful as in other countries, providing less innovation than it should.

- Automation: The traditional industry has relied on labor-intensive schemes. The human productivity stands far behind of the levels productivity achieved by the use of automation and machinery in more developed countries.

Concluding, the deep transformation of the country after the industrialization has arrived to a situation where the old strategies are not successful anymore. China needs to shift from the cheap labor industry to a renewed talented and improved structure. This change will be crucial to ensure future growth and the capability to compete against other regions that changed long time ago.

3.4- Land Prices

The rapid industrialization process of China, especially during the last 20 years, has resulted in a huge amount of new industrial land, mainly following an extensive form of urban land use. This situation was induced by the cheap land prices offered by Chinese industrial parks, due to the laws of the country to attract foreign investors. The policies helped foreign companies to get land to build facilities at a very cheap or no cost, so there was no concern about land-efficiency and rationalization of the industrial areas.

The improvement on the market and the subsequent industrialization and urbanization have taken place at the expense of what was formerly cultivated land, losing farming soil despite the need of more food for the growing population. In 1998, The Land Administration Law of People's Republic of China was instituted to limit the conversion of agricultural land to non-agricultural land and ensure the food production. However, these regulations have not succeeded and the industrial lands kept on growing. In fact, in a manufacturing country like China, the industrial lands were the key for the development and creation of new and bigger cities that are leading the economic growth.

Since the People's Republic of China was founded in 1949, the industrial land allocation policies have varied through many stages:

- 1949-1954: State-owned and private land co-existed. At the beginning, there was a market of private land that could be rented and sold, but the majority of land was progressively transferred to the state. In order to use the land, rent or fees had to be paid to the government.
- 1955-1978: The rents and fees were cancelled. The lands for construction or agriculture were allocated according to the overall resource plan designed by the government, without the need of paying for the use.
- 1979-1991: In this period, the farmers were given use right titles but land continued being state-owned. The industrial land was assigned by the state and paid for industrial use depending on the situation. The manufacturing boom urged a new management.
- 1992-now: The rural collectives own agricultural land and the state owns rural land. There are a variety of use rights that can be given depending on the kind of land, and the land can also be expropriated by withdrawing the use rights. In this period, China adopted the concept of granting the State-owned land use rights to individual investors with distinctive contracts depending on the purpose.

Since the creation of the granted land system, there have been many regulations, with the most important change in 2006 when the Ministry of Land and Resources issued the Guidelines for Grant of State-owned Leaseholds by Invitation for Tenders, Auction and Listing. With these regulations, there were stipulated six types of land use purposes, grouping together the commercial and industrial purpose that requires a purchasing price

to obtain the use rights. The minimum industrial land price guidelines were issued along with the regulation and almost a decade after, according to the economic development, they don't match the current conditions.

To change the situation, the government is implementing a renewed version of the grant contract for construction land for industrial purposes. Originally, the granting contract had a maximum length of 50 years but will now be shortened to a maximum of 20 years. Along with other new policies, with the aim of promoting land use efficiency and shift from an extensive to an intensive use of the industrial land. Therefore, the industrial land prices are growing and this trend is expected to continue in coming years. Along with the prices, the uncertainty created by shorter agreements is a new problem for foreign investors.

3.5- Raw Materials

The rise of China through the 2000-decade made it become the biggest raw material consumer in the world. The insatiable need of natural resources has had a huge influence on the evolution of material prices and commodities market. Not only because of the manufacturing and construction consumption but also because of the surging Chinese market, a fact that increased the global demand and that has driven up prices. For example, the oil market boomed the prices coinciding with the growth of Chinese demand and with the cost-per-barrel reaching \$140.

It has always been a matter of demand and supply, the growth of production and consumption made China need more and more commodities and had to import a lot of them. Therefore, given the nature of the raw materials market, the increase of demand in Asia finished with a price rally.

At the same time, due to the impossibility of self-supplying, the state-owned Chinese companies started investing abroad in order to possess and control mines and croplands. Mainly in Latin America and Africa, the companies invested in mines, croplands and reserves of natural resources in order to ensure availability and increase the global production of raw materials with the aim of getting better prices. As the main consumer of a certain commodity, China has a strategic interest in ensuring the supplies and controlling the reserves.

The commodities boom affected products of all types. Instead of looking at each material particularly, in order to understand the global trend, we can study the evolution of the S&P GSCI (Goldman Sachs Commodity Index) that serves as a measure of commodity performance over the time. This index contains a variety of resource markets from many sectors like energy products, metals or agricultural products and is able to reflect the global situation of the market because by aggregating so many products, the individual variations are minimized.



Chart 7: Goldman Sachs Commodity Index Evolution

As can be seen in the chart, at the beginning of the decade, the commodity prices experienced an incredible leap until the beginning of the financial world crisis starting in 2008. Once the crisis finished by 2011 the index got recovered reaching high levels until mid 2014 when the Chinese economy slowdown rocked the markets. After all, it is an extremely volatile market, but the impact of the Asian powerhouse on it is easily noticeable.

A good particular example of the influence of China on a certain commodity market and its producers can be observed looking at the evolution of the iron ore:

China manufactures half of the world's steel production, and 98% of the iron ore is destined to this material. China imports 2/3 of the global iron ore transactions receiving the 80% of the whole Australian production and 50% of the Brazilian production. In order to provide this amount of material, these main exporters created and updated infrastructure to supply the growing needs of iron ore. However, the Chinese market started reducing the consumption and there was a reduction of imports. As a consequence, the excess of supply led to a price decrease and the economies of the exporters struggled: Australian and Brazilian currencies have depreciated since.

It is expected that India will need a lot of metal imports to feed the growing industry, but until this happens the Chinese demand models the price of many commodities and has a decisive influence on the economies of the raw material suppliers.

As a conclusion, the manufacturing capacity of China and the developing market implies a huge need for raw materials that has completely transformed the materials markets. Nowadays, despite the fast growing prices trend of prices has changed, it is not possible

anymore to source at the price levels that we could find at 2002. Of course, all the countries in the world have to face the same prices when buying the materials, but for a producer and exporter like China, such a rise makes it difficult to remain offering very cheap costs and being so competitive.

3.6- Shipping

When pointing the many factors and shifts that are affecting the Chinese industry, the problem is usually the increase of costs. When approaching the shipping, comparing the cost at early 2000 and in 2010, the shipping rates are higher but the trend since 2010 has been a cost reduction based on lower fuel price and more efficient transport means. However, some other considerations must be taken into account, and the shipping is often regarded as an inconvenience.

The shipping sector has been in constant evolution for years, creating new routes, bigger and more efficient vessels and huge hi-tech ports. The demand grew steadily for years so did the capacity, and new infrastructure improved the performance and the cost of shipping freight. New vessel classes like the Triple-E, able to transport up to 18,340 TEU took advantage of the economies of scale and prepared the transportation world to respond to the increasing demand. However, the economic recession impacted the global trade and redefined the demand. Nowadays, the situation depicts excess of capacity for the actual demand. This fact, along with lower fuel rates and the achieved economies of scale mentioned before, has ended up providing cheap shipping costs.

Nevertheless, the market and the final consumer mindset have also evolved and the cost is not always the most important consideration. Even at low rates, shipping the products from China implies issues that are sometimes not compatible with a company's strategy:

- Lead times: The transit time from China to most ports in US and Europe is between 29-35 days plus the time spent to load and unload the cargo. Compared to the much shorter lead times offered by local manufacturers (can be as short as just hours) and the consequent flexibility, the cheapest option does not guarantee the best results. Importing from offshore markets is highly time-constrained and not suitable for all kinds of sectors: for example some textile companies need an extreme fast response to adapt to new trends, what cannot be achieve with Chinese manufacturers.
- Risk & Uncertainty: Sourcing the products from a foreign country always implies more complexity and adds uncertainty to the supply chain. Shipping the products from China makes it very difficult to have control on the transportation and the location of the freight, and because of the longer shipping process there are more players involved and more risks. For example, the ports strike in Los Angeles at the beginning of 2015 caused huge loses and paralyzed the whole activity of many American companies.

3.7- New environmental and safety regulations and taxes

With the beginning of the industrialization process, China decided to embrace liberal policies in order to generate wealth and improve the life standards of the population. Ever since, the economy kept on growing by opening to international markets and offering the Made in China cost-competitive products. In addition to cheap costs, one of the factors that attracted foreign investments (mainly from America and Western Europe) was the environmental law. Companies from developed countries with strict environmental regulations and a wide variety of safety and health controls in their home countries found it very convenient to manufacture in China, where the industrial activities would not be

influenced or limited by emission restrictions or pollution regulations. Therefore, the alternative to produce at the cheapest cost at the expense of the environment has been a common choice for lots of firms worldwide, which saw an increase on their profit and loss statement and did not pollute their own environment but the one of a foreign country.

China has been following an old and out-of-date economic system, inefficient and unsustainable that just cares about economic growth without considering the environmental footprint and the damage on their land. Historically, the Asian country has relied on fossil fuels for electricity and steel production and the government didn't work to improve the situation and didn't set restrictions for the industry. For example, during the last 30 years, most of the energy was obtained by using coal because of the abundant quantity of reserves and it's cheap price although the pollution related. Even if the number of automobiles is way lower than in the US, China emits almost twice the amount of greenhouse gases and accounts for nearly the 30% of global emissions.

As a consequence, the current situation in the most industrialized areas has reached an unsustainable point:

- Energy consumption kept on growing year after year for decades, mainly because of the extensive and inefficient use of the resources. The government needs to revise the strategy because otherwise, in a next future it might become too complicated and expensive to supply the whole energetic needs.
- The population of China has already started facing the consequences of the lax environmental regulations. The main cities are often covered by a thick layer of poisonous pollutants that make the air hazardous to breathe with the average density of PM 2.5 particle pollution reaching levels of 20 times of the maximum

recommended by the World Health Organization, and important percentages of land and water are contaminated so can't longer be used. The worst is the impact on the Chinese: the air pollution alone is estimated to kill almost a million people a year and cause more than 5% of GDP in health care costs, material damages and the previously stated premature deaths.

Finally, after external and internal pressures, the government has worked on an environmental reform that is projected to improve the situation and fight against pollution in next years. On January 1, 2015 China implemented an updated Environmental Protection Law, revising the old and useless version of 1989. According to the new law, the environmental protection will be considered along with socioeconomic development. The main new points of the reform include:

- Increased accountability of polluters: Previously, it was more profitable for most of the companies to violate the environmental laws and to pay the fine than respecting the laws, since the fines were paid just once. With the new law, the fines will be accumulated, really punishing the violators.
- Increased accountability of government officials: The corruption that was consistently waiving or reducing the fines with mutually beneficial relationships between manufacturers and government departments will be prosecuted. The new penalties will be heavier and the means to control it will be more effective.
- Increased public disclosure: The new articles of the EPL require publicizing information regarding environmental quality and monitoring along with other specific information of the pollution generated depending on the kind of activity. Historically, the Chinese companies have not disclosed much information about

these issues and the lack of monitoring instruments made it difficult. With the new law, the activity and performance will be much more controlled and international companies will have to be aware of the terrible effects that the new data could have on the public opinion if they don't change.

- Public interest lawsuits: Thanks to the reform, environmental protection groups or individuals are able to bring lawsuits against polluters, what could not happen before. Therefore, there will be more people with means to fight against pollution and contamination, with more involvement with monitoring corporations to make sure they carry out their task.

As a consequence of the new situation, the manufacturers face a different scenario: the old paradise where the cheap production disregarding the environmental issues was giving cost competitiveness is coming to an end. China is now investing in renewable energies and changing laws to reduce the pollution and fight for a better future. From the corporative point of view, the new policies will come together with important structural costs since the old inefficient facilities will have to close and a huge investment will be needed to revert the situation.

Companies manufacturing in China to "abuse" the regulations will not be welcome anymore. The cheap but harmful business strategies will be no longer tolerated, what represents another fact that will increase the cost of production in China in the next years. Manufacturers will have to invest in less-polluting facilities and spend money on recycling, and some effects are already noticeable: the coal consumption of China decreased in 2014 for the first time in more than a decade.

This must be seen also as a great opportunity for the future: if the country is able to create the infrastructure and the appropriate atmosphere to develop an eco-friendly industry, the initial impact of the increase of cost could be mitigated by a future sustainable economy. China is already the leading investor in renewables and spent \$89.5 billion in 2014, accounting for more of the 30% of the global investment in this market. However, the immediate increase on costs is seen with concern by the local producers, who will see how some foreign companies move their production to other countries.

4- Overall Manufacturing Cost-Competitiveness

The most important factors that have influenced the rise of manufacturing costs in China have been stated and explained in the previous chapter. Nevertheless, the whole world is a dynamic system changing on a daily basis and it is mandatory to consider the global picture to successfully understand the situation. In a global world, the absolute cost numbers of China are not the decisive factor, but the relative costs compared to the competitors.

Traditionally, the general conception about manufacturing points that the most developed countries in North America, Western Europe represented pricy costs while regions in Latin America, Eastern Europe and most of Asia could offer low-cost production. But this conception is out of date after changes that like in the case of China have redrawn the map of comparative competitiveness. Using data about the cost of manufacturing in different countries and aggregating all the cost drivers, from labor costs to energy, we can have a chart that illustrates the evolution of cost-competitiveness during the last decade. The following chart takes the average manufacturing cost of the US as the base (100) and represents the other countries as a percentage of the US cost.

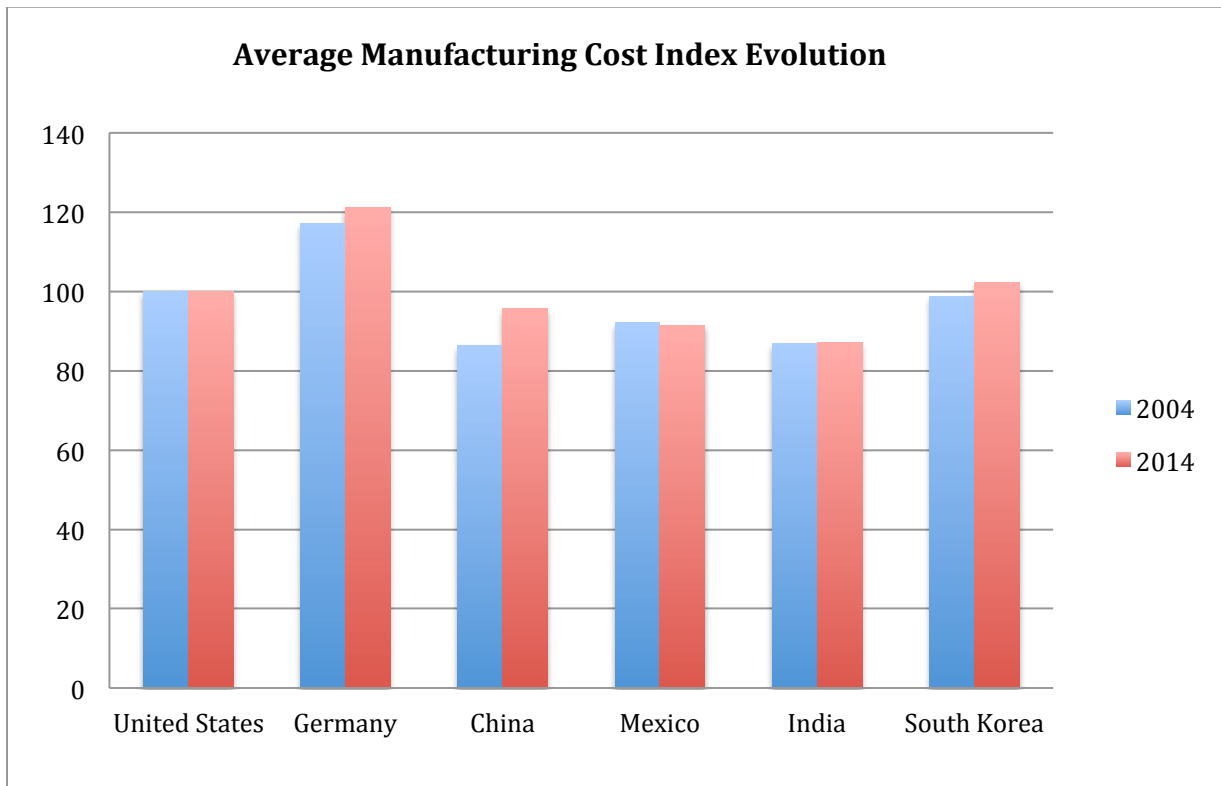


Chart 8: Average Manufacturing Cost Index Evolution

The chart displays a comparison of the prices at in 2004 and 2014. Despite having data of more than 25 main exporters, I decided to include just a small part of them to explain main points since the trends of some regions can be explained by just one country

- In general, the total costs rose steadily everywhere. However, US and Mexico have proven to be able to maintain similar levels and as the costs increased everywhere else, these two countries have improved their competitiveness. The US and Mexico are expected to be the most benefited from the more expensive prices abroad, and are experiencing the re-shoring phenomenon. The boost of productivity, the drop of the price of Natural gas and moderated wage growth made it possible for them.
- In the group of countries historically expensive, most of them continued incrementing the production costs. It is the case of Germany and other Western

Europe countries like France or Italy but also of Australia. On the other hand, Netherlands and the UK were able to limit the increase of costs and even if their rates are still expensive, they became more competitive.

- From the widely regarded as low-cost countries, a group of them are still cheap and attractive for new investments. It is the situation depicted by India in the chart and which also explains the case of Thailand and Indonesia, the country with the lowest cost levels.

- Finally, we have the group of previously considered low-cost countries that changed their status and raised their costs. This is, of course, the group where we can find China and also others like Russia or the Czech Republic whose costs are almost at the US level. It is also the group of Brazil, whose costs have even surpassed the offered by the US industry.

Concluding, the historical perception about the price of manufacturing or outsourcing in some countries is completely wrong. The economic shifts have drawn a new distribution that the companies will have to take into account when taking strategic decisions.

5- What is next for the US companies?

The US is the main importer of Chinese products in the world. This strong relationship is based on a large quantity of American companies that have direct investment on the Asian powerhouse and others that just purchase products from local manufacturers. In 2014, China's exports to the US accounted for over \$465 billion, about 20% of the total imports. Looking further, the highest volume of imports was related to the sectors of electronic equipment and machinery.

Due to the strong trading influence of China on the US, the economic and social shifts that have reshaped and transformed the costs of production in China are also having a big impact on the US and its companies. From now on, producing in China is not likely to ensure the best price, but there are other factors that must be taken into account, looking at all the pros and cons. With the new features of the market, the investors have to react to remain competitive and adapt the corporative strategies to seek future benefits.

It is true that each case is different and the diversity among sectors is arguably remarkable. For some industries China is still very competitive and for others it hasn't been for a long time. Each reality is influenced by factors like the competitors or the existing suppliers, but when referring to the general situation, there are usually similarities that allow us to have a global overview. For the US companies producing in China, the most feasible options are discussed below.

5.1- Stay in China

The first option is the most obvious one: stay in China. The numbers prove that the golden age for foreign investors doing business in China is over at least in the way that we saw it

during the last 15 years, but it doesn't imply that there are no opportunities to use it's manufacturing production to make money. Certainly, the traditional mindset and strategy will have to be adapted to the new conditions, but with the correct arrangements China can still be a winning bet for the future.

It is basic to remind that even if the prices are not like before, China is a leading region in the industrial world with all the implications. Any company staying in China will be able to benefit from the extended established supply chains, the outstanding new infrastructure and the wide range of suppliers, agents and parties prepared to help the business development. The variety of partners and allies that can be found in China is not present everywhere and it is one point that reinforces the country's position. Three alternatives to make the country a suitable place for future business for the American companies are explained next.

5.1.1- Machinery and automation to mitigate the effect of labor costs

The rising labor costs, social protests, accusations of exploitation and the desire for better quality products are making Chinese manufacturers start to implement and expand the automation and robotics in their factories. In 2013, the number of robots per 10,000 workers in the Chinese manufacturing sector was 23, according to the International Federation of Robotics. Compared to 141 robots in the US or the 396 in South Korea and 332 in Japan, the leaders in high-technology automated industries, the numbers demonstrate that the country's producers still have a lot to do.

Traditionally, the manufacturing operations in China have been done using labor-intensive assembly lines with low margins. Very different to the tasks performed by neighbors Japan or South Korea, the major suppliers of advanced electronic components that are produced

with the aid of automation. The high technology production developed in these two countries, especially in the automotive, electronics, metals and machinery industries, makes them very competitive and a guarantee of quality. However, the nature of the Chinese industry in charge of less standardized products, with short shelf life times and constant changes, made it more difficult to extend the automation.

The last years have changed the situation and one of the principal responses, has been the automation boom. Chinese factories have started a revolution and are beginning to install robots for certain operations of the assembly work. Depending on each case, the efficiency can be improved from a 10% up to a 30% through automation. The automation revolution in China along with the large scale of its industry, made it become the largest market for industrial robots in the world in 2013. All multinational robot makers are investing fiercely in China and the sector is forecasted to grow at 15% in the coming years. From the 23 robots per 10,000 workers in 2013, the expectations point a rate of 100 robots in 2020.

Overall, the initial investment on automation systems is estimated to pay-off between 1 and 3 years in the assembly tasks, and the price of implementing the automation will decrease with future expertise and economies of scale. For companies already operating in China, moving to other facilities requires a higher investment than automating. Therefore, for the industries suitable for automation, the robots represent a great solution to recover the lately harmed Chinese competitiveness and it will certainly be the choice of some US corporations.

The main problem for China is that automation is only suitable in some cases, and it is useless for some labor-intensive tasks. The great advantage of China that made it the manufacturing hub was the cheap labor, so automating means losing this advantage. It is

true although, that the automation process will be very effective combined with the industrial atmosphere in certain sectors.

5.1.2- Cheaper inland provinces in China

As stated previously, the automation is a great solution to enhance the efficiency and minimize the effect of some cost increases. However, not all the sectors can succeed by investing in machinery. The robots are being used to fight against the higher wages although if we look at the whole picture of China, we can find the alternative in the country itself because of the huge disparity of salary levels depending on the province.

The biggest concentration of Chinese factories in charge of producing and exporting consumer products is located in the coast with the aim of reducing trucking costs and time thanks to the easy access to ports. Furthermore, the producers of a certain product tend to be clustered in a certain region with material suppliers and skilled workforce also settling in the same areas. After the industrialization boom and for many years, this strategy made a lot of sense since the concentration of manufacturers and suppliers allowed beneficial economies of scale, overall cost reduction and rapid development. China experienced a massive migration of workers from inland provinces to coastal areas to work in the factories. All this facts started to grow a gap in the salaries between the coastal industrialized and the inland provinces.

At the same time, the spectacular development of the nation allowed the government to invest in new infrastructure and revitalize the central and western provinces, where the main cities have nowadays communications no worse than the ones next to the Pacific Ocean. Progressively, the conditions and suitability for industrialization in the inland

provinces improved and for investors, moving to inner regions presents two main advantages:

1. Lower wages: As shown in the chart below, the difference of minimum salary averages a 30% between inland and coastal provinces. Nevertheless, the minimum wage does not reflect the actual salary levels that have been increased a lot in the coast due to shortage of labor force. Overall, the difference is much bigger and the companies can reduce more than half of their labor costs by moving to inland provinces.

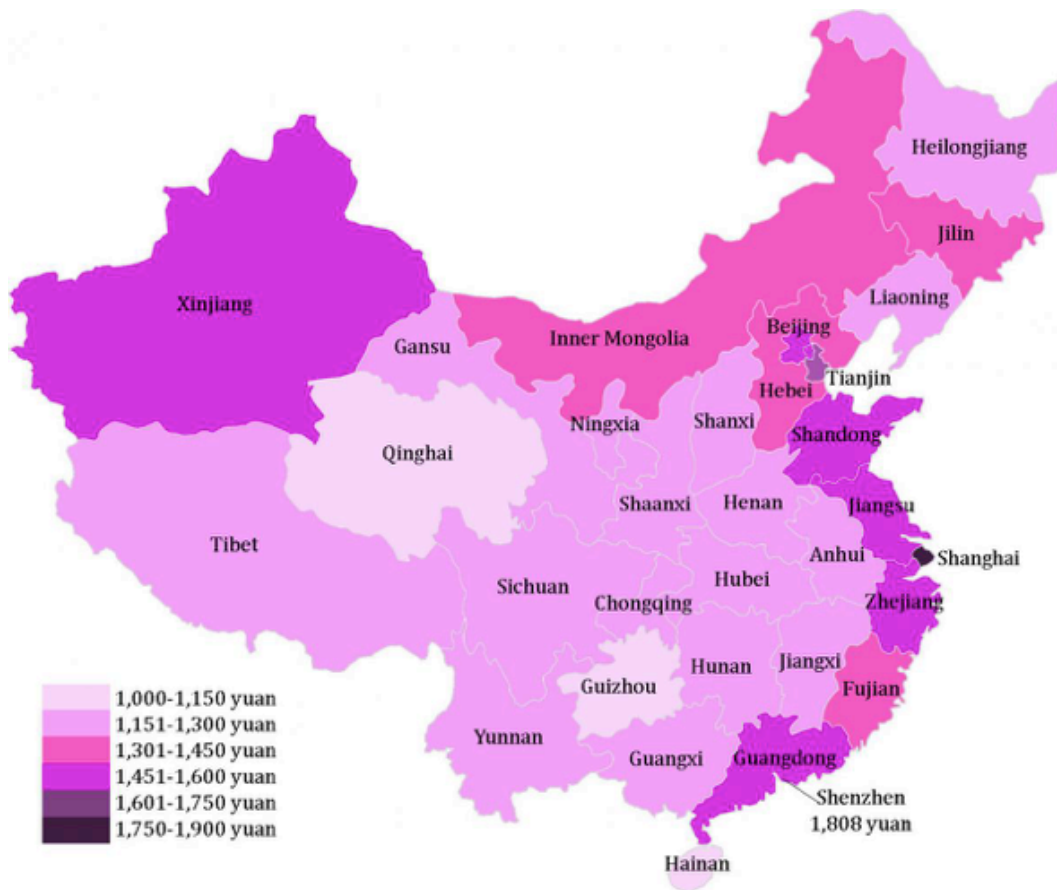


Chart 9: Minimum monthly wages distribution in China

2. Availability of workforce: Inland workers have long migrated to industrial areas looking for jobs in manufacturing. Traditionally, moving to these areas ensured

higher salaries and better standards of life. However, the development of China and the consequent rise in life costs made that even the increased salaries are not enough to maintain the standards previously achieved by the workers. The widened gap between rich and poor is paralyzing the migration flow and the workers from the countryside prefer to live in the rural areas than going to the coast to work endless hours on production lines for mere subsistence wages. This shift comes together with a demographic reduction of Chinese in working age. Because of these facts, the inland provinces are now the ones able to offer the required workforce since recruiting workers is easier close to their home towns: instead of people moving to the factories, the factories are moving to the people. Despite of the existence of more available workforce, most of the prospective workers from inland China are not skilled. Most of them might be suitable for assembly or easy tasks, but it's hard to find engineers and graduates for more complex jobs.

In addition to the discussed principal advantages, inland provinces usually present some more like lower electricity costs and lower rates for renting factory and also favorable local policies from the government willing to assist the development of the inland regions.

Nevertheless, starting over new at an inland region also implies a less developed industrial atmosphere, higher transportation costs and it also raises a problem: with future development subsequent to the industry, the inland provinces will progressively increase the costs and standards of living. Therefore, the solution might be useful for a period of time, but it is difficult to predict how long will inner provinces remain more competitive.

Summarizing, the inland regions are able to offset some of the problems of the Chinese manufacturers. However, these areas seem to be suitable only for labor-intensive

industries, highly depending on workforce. The created infrastructure is a pivotal first step even if there is still a lot to do, but the inner parts of China are already a feasible reality and companies like Foxconn Technology Group (Apple's main supplier) are exemplifying the expansion of the industry inside the People's Republic of China.

5.1.3- Expansion in China to take advantage of the growing market

In previous points, I have referred to China as the world's factory. This name is still suitable, although nowadays China is not only a main producer but also a huge consumer. The growing Chinese market represents an astonishing number of people and companies with a demand that needs to be served and that will keep on increasing for coming years. Even if costs are higher than before, the opportunity to potentially serve the growing Chinese market is a key point when evaluating the strategic decision of a company between staying in China or not.

People's Republic of China is the world's most populous nation with over 1.35 billion inhabitants, with almost a 20% of the world's population. Because of the industrial boom, the society has gone through an urbanization process that proves the evolution of the country: in 2011, China's urban population exceeded the rural population for the first time in the history. The urbanization is a transition that comes with growth and development, as people shift from self-sustainability to specialization and therefore it is created a need for cities to be build, infrastructure and consumer goods. The urbanization of China has enabled the beginning of the new middle class and was the necessary step to boost the local markets.

According to the current trend of Chinese growth, it is crucial for US companies to consider China not only as a prospective producer but also as a leading consumer. After all, even if

the numbers demonstrate a slowdown, the Chinese economy is still growing year after year, as well as the Chinese middle class. It is worth to state a surprising shift: the flow of shipping containers among Asian countries is bigger than the flow between Asia and North America plus Europe together. Taking into account the situation of most of Asian countries that are just exporting their products, it is obvious that the rising Chinese demand has completely transformed the flow, at the time that the country became a leading importer.

The recent history of the occidental developed countries indicates that a growth in their markets is very unlikely to happen. For established companies, the key to growth comes at developing areas where they can introduce their products over new. Due to the loss of competitive advantage, China's leaders are trying to rebalance the economy to stop relying on exports and trigger the local investment towards domestic consumption and services. After the cost structure changes, China's manufacturing base has kept on growing because even if the exports are suffering, the increasing local demand must be satisfied. Summarizing, China must be contemplated as a real opportunity to expand in a young market that might become the biggest one.

There are many examples of successful investment strategies adopted by US companies that clearly benefited from sales in China, and that should inspire other companies to consider the possibilities of the country. GM is one of them:

- The car manufacturer General Motors had long focused on the domestic market, the US. However, they detected the potential market in China and invested in a country that has become the worlds biggest and fastest-growing vehicle market, with a population driving more than 140 million cars. The strategic decision to promote the Chinese market is paying dividends and GM's operations in the country

amounted more than \$500 million in the first quarter of 2015, from the total \$945 of the company worldwide.

5.2- Move to real low-cost countries in Asia

For years, lots of leading companies from many sectors used facilities in China to take advantage of the low costs. The strategy of leaving China and settling in a cheaper country is basically repeating the same: moving somewhere else to ensure the cheapest costs. After stating and explaining some reasons for US companies to continue their manufacturing operations in China, it must also be admitted that leaving China and moving the production to other cheap-labor countries should be considered as a feasible option.

As explained before in the global relative competitiveness chapter, other countries from Asia are experiencing a similar boom to what China lived during its industrialization. In these areas, the availability of cheap workforce and the governments willing to attract foreign investment are the key pillars to consider. It is also true that there are many negative points to deal with: as sub-developed countries, the corruption, lack of necessary infrastructure and skilled workers for some jobs, the lack of reliable suppliers in the area and especially the lack of knowhow and expertise can be a real problem. Furthermore, the problems with intellectual property are a huge concern for foreign companies in Asia. However, just like it happened with China and many others, the expected industrialization should solve these issues.

The countries that are more appealing for foreign companies to substitute China are:

- India: This country offers an impressive pool of workforce at a very low cost. In addition, due to the large population it must be also taken into account the potential of this market that could become an important market like China.

India has the advantage that it's easy to find workers who speak English and with superior degrees. Because of this reason, India is a leading country providing IT and call center services to foreign companies. However, the infrastructure is not existent and the government and laws are not helping to create the correct atmosphere to be the biggest rival of China. It is curious that India is divided in states with their own governments and it is compulsory to pay tariffs when moving the goods from one state to another. All this inefficient bureaucracy is certainly slowing down India's development.

- Vietnam: Vietnam is usually regarded as the first option to substitute China as low cost manufacturer. Despite being a communist country, the growth of the business in Vietnam has been impressive. While China wants to change the policy to have less dependence on foreign investments, the Vietnamese government welcomes the investors allowing the procedures to be much easier than in China.

Vietnam has a population of less than 100 million people, what cannot be considered a large labor pool. However, this country is being extremely successful as a manufacturer for low-tech and labor intensive products, especially apparel, shoes and accessories. However, unlike in China, the more demanding industries have problems to find skilled workers for complex and sophisticated products.

The wages in Vietnam are lower than in China but are increasing at a higher rate. Vietnam experiences many problems due to corruption, and the infrastructure is very poor and old, lacking efficient ports like the ones of China and the correct infrastructure to distribute natural gas.

· Thailand: As described before in the competitiveness chapter, Thailand is on top of the ranking of the most competitive manufacturers among the list of the principal producers. In addition to low costs, Thailand has already a significant transportation and utility infrastructure that enables an easier settlement of factories. The problems with Thailand are mainly the political instability that usually makes the investors go away and also the number of natural disasters damaging the country too often.

Overall, investing in a sub-developed country is always a risk since no one can know exactly what will happen in the next future. Nowadays, these countries are mainly hosting non-advanced operations due to the many requirements. For labor-intensive jobs like clothing, the developing regions of Asia are stealing the business from China and they threaten to go further and continue to compete with China for more importance in other industries.

5.3- Competitive countries closer to where goods are consumed: Reshoring

Finally, another great alternative for US companies that might have seemed impossible just a few years ago is bringing back the production to North America. Even if the manufacturing costs might be lower in Asia, the expensive transportation, customs and insurances are reducing this difference and sometimes giving advantage to local production. Moreover, having the goods being produced so far away implies a need for high levels of inventory due to long lead times, what must be also considered as an important cost that can be reduced with facilities closer to the final consumer.

The US market is probably the most exigent and demanding in the world, and the economic and manufacturing shifts have allowed the increase of competitiveness of the US

and Mexico. The fluctuations of demand and the need to respond rapidly to this demand and surging trends has traditionally been an important problem for companies importing their goods from China. The time and effort required to move the finished products from the factory to the points of sale, along with the risk and uncertainty involved, is not always compatible with some businesses.

Some of the most significant reasons to move the capacity to America are summarized below:

- Shorter supply chain: With equal manufacturing conditions in China or America, it is obvious that the long distance between the final consumer and China makes a big difference. There are many costs associated with a longer supply chain that are usually not considered: bigger workload, more intermediate parts, and more risk. Having the production close to the final consumer simplifies and accelerates the whole process and might be a strategic advantage. Overall, the possibility to shorten the supply chain and all the related benefits are the top reasons to reshore.
- Quality: One of the common complains about Chinese products is usually the quality problems. The lack of standardized procedures and standards have been traditionally a problem for companies involved. Bringing back the production ensures a higher level of control over the whole process and is usually pointed as an easy way to improve the quality.
- Intellectual property: This is probably one of the most known problems with the Chinese industry. It is not hard to find counterfeits of whatever good being produced in China and the harm for the companies who spend millions in innovation to see

how they are copied is evident. The comeback to America is an excellent way to ensure a better compliance of the intellectual property laws.

- Time difference: Doing business with China means that the operations will be done during periods of time different to the working schedule of an American company. Controlling the production in China will probably imply uncomfortable schedules and problems surging when no one is in the office. Being in the same time zone fixes this problem.

After decades of industrial delocalization and due to the latest shifts, the companies are starting to bring back their production to America. The US is being highly benefited from it, but Mexico will also have a pivotal role on the coming years.

5.3.1- US

For years, the US industry has seen how local factories had to close and the capacity was constructed in China. During the exodus boom, most of the corporations moved their production to China or sourced goods or components from there. This hard times for the American Industry made the local manufacturers adapt to lower prices to avoid going out of the market: the US industry has evolved and has become more efficient and cost-effective. By taking advantage of automation and maximizing the productivity, the US producers could relief the pressure, even if they had to deal with lower margins than before.

This painful process of adapting to the fierce Chinese competition eliminated some important American industries, but at the same time made others better and prepared them for the current situation: the US manufacturing capacity has been reorganized to have a lower cost structure. Factors like the employment conditions and the regulations have

changed in favor of the corporations. Moreover, some practices of the industry very developed in the US, like lean manufacturing and the optimization provided by certain planning software systems, have allowed to achieve the current high levels of productivity. The US offers the suitable option to reshore the manufacturing operations. Additionally to the general advantages related with reshoring, there are clear differences between Mexico and the US, and the specific reasons to bet on the US performance are:

- Made in US: having the factories in the country, employing the local people and having a positive impact on the economy of the country is an extra. Many corporations promote their products reinforcing their marketing strategies by reminding constantly that the production is done in the US. In a fierce competitive market, it can be the difference to beat the competitors from other countries.
- Currency risk and bureaucracy: international operations are more complex than national ones. The different laws and regulations are usually a problem when dealing with foreign parts, and the effects of any currency variation on a company's result cannot be dismissed. It is clear that when all the activities are made in the same company, some of this complexity and inherent currency risk disappear.
- Innovation: it is a common problem for many corporations the distance between the R&D teams and the manufacturing operations, what incurs in slower product development and redundant investment that could be saved. Producing in the US enables an easier connection between all the departments involved with the innovation.
- Cultural and language barriers: Obviously, having the business back in your country ends the problems related with cultural or language problems. The Chinese

New Year is a great example of the problems that arise because of cultural differences, since the demand in the US is expected to behave normally but the production in China highly affected by slowdowns.

5.3.2- Mexico

Mexico has become the cheap and close manufacturing option for companies serving the US market. Many kinds of industries traditionally located in China are now looking to Mexico as a great alternative to have equal or lower prices than Chinese ones and with a faster response and sometimes a better quality.

At the beginning of the NAFTA in the 1990, Mexico went through an industrial boom, but the one that we are living now can be even greater. The volume of trade between Mexico and the US has risen about a 30% since 2010 and foreign investments are setting a new record of \$35 billion, with a subsequent increase of share of the Mexican products on the US market. Mexico has become the most competitive producer for the North American market and in some cases, for the whole world.

In some cases, moving the production to Mexico might not only imply a loss of jobs in China but also in the US. However, disregarding the costs, between trading with China or Mexico, for the US it is more beneficial to trade with Mexico because of distance: about a 40% of the parts imported by Mexico to produce their goods came from the US. Moreover, the shorter distance also implies a more similar culture and the same time frame: generally, it is easier for US decision-making people to do business with Mexico, where it is also more convenient to fly.

The main problems with Mexico are the many differences among the population, where only a small group is educated and trained to compete in the industrial world. Also, the organized crime and corruption are usually pointed as problems.

6- Analysis of Garvin Industries

For my research project, I wanted to do an analysis and develop a specific case. The analysis part seeks demonstrating and validating the previous theoretical work. The case studies of famous consultants, data from official sources and government records are a proof of the changes, of the increasing costs of manufacturing in China and of the competitiveness improvement of other countries. Therefore, all of these facts should be translated into the final cost of the products sold by the manufacturers, and that is what is investigated in this part.

With the aim of performing a real research, the project took the next step and I contacted Garvin Industries. This company perfectly fits the objective of the special project: they are currently sourcing from China, but are willing to review the purchasing strategy to discover whether it is possible to find better conditions somewhere else.

6.1 - Company Overview

Garvin Industries is an electrical components manufacturer and distributor. The company was founded by a young Irish immigrant called Samuel Suffrin Garvin, who decided to pursue a career in the electrical industry after learning from the brilliant inventor Thomas Edison. The previously named Sam Garvin & Co. started stocking a few hundred electrical components.

Nowadays, Garvin Industries is still a family-owned manufacturer that stocks thousands of items to satisfy the customers. Garvin is located in Franklin Park, Illinois and serves both local and national electrical distributors and contractors around the US. The company manufactures and sells high-quality electrical, low voltage and lighting products for

electrical installations. Some of the product families are conduit boxes, conduit fittings & supports, clamps and fasteners.

6.2- Sourcing research

Once in contact with Garvin, we looked for a research planning that would benefit both parts. We accorded creating a list of products with different items that I would try to investigate and find suppliers capable of manufacturing them. With this methodology, I expected to be able to figure out the trends and production costs among different manufacturing countries.

6.2.1- Products and features

Garvin provided a list of 11 products to do my research and they also created an email account for me to contact prospective suppliers around the globe on their behalf. I renamed the product to keep the confidentiality, creating families depending on the manufacturing process. I researched on the features of the items and the manufacturing insights to completely understand what I would be doing and to be ready to talk with the suppliers. The basic information to understand the products is presented below:

Family A: Stamped Steel

Item	Description	Material
A1	4" Square box, 1-1/2" Deep with a metal stud bracket	Steel -0.0625" - G60 Galvanized
A2	4" Square box, 2-1/8" Deep with a wood spike bracket	Steel -0.0625" - G60 Galvanized
A3	4" Octagon box, 1-1/2" deep	Steel -0.0625" - G60 Galvanized
A4	Handy Utility box, 2-1/8" Deep	Steel -0.0625" - G60 Galvanized
A5	Deep Switch Box, 2-1/2" Deep	Steel -0.0625" - G60 Galvanized
A6	4" Square flat cover	Steel -0.0625" - G60 Galvanized
A7	Handy Utility box cover	Steel -0.031MIN" - G60 Galvanized
A8	J Cable Support Hook	Steel -0.047" - G60 Galvanized

Manufacturing process: Metal Stamping

Metal stamping is the manufacturing process of creating metal components by applying extreme pressure to a blank piece of metal and forming the metal into the desired shape.

The metal is shaped by punches and dies that give the stamped part its final shape.

Most metals can be shaped using the metal stamping process, and the machinery used ranges from a basic hydraulic press to huge machines like drop hammers. Stamping operation can be done with a single die station or multiple die stations using different dies. The use of multiple stations and dies progressively allows a better accuracy and tolerance, but it also increases the time and cost of the operation.

Material: G60- Galvanized Steel

The galvanization is the process of applying a protective zinc coating to a metal to prevent rusting. The zinc prevents corrosive substances from reaching the metal (in this case the steel), by forming a barrier and acting as a sacrificial anode. The main purpose of the galvanization of the steel is to improve corrosion resistance and it is widely used with outdoor products due to its protecting features and relatively inexpensive cost.

There are many varieties of galvanized steel, and the standardized specifications are defined by the ASTM (American Society for Testing Materials). According to these specifications, "G" stands for Galvanic- zinc coating, obtained by the hot-dip galvanization process. The numbers (we can find common designations like G30, G40, G90....) represent the weight (in ounces) of zinc on the surface of the steel per square foot.

G: hot dipped galvanized, galvanic coating

60: 0.60 ounces of zinc coating per square foot (0.6 Oz/ft²)

ASTM sets the minimum weight of coating for each standard. The weight of the coating is directly related to the corrosion resistance and thus with the service life of the product. For example, if a G30-coated steel product is expected to last 10 years before it starts rusting, a G60-coated will be expected to last 20 years in the same conditions before the rust appears.

Family B: Wire Forming

Item	Description	Material
B1	Standard Bridle Ring	Steel C1008- Zinc Plated

Manufacturing process: Wire Forming

Wire forming is the manufacturing process of bending, cutting and shaping a metal wire into the desired shape. The process begins with a steel wire that is shaped through successive stages with different machines to obtain the final product.

Material: Steel C1008- Zinc Plated

The different types of steel include a wide range of compositions and properties. All the standards and specifications for steel are determined by the American Iron and Steel Institute (AISI). Defined by AISI we can find the C1008 carbon steel that is equivalent to the ASTM A109. This steel also contains manganese, phosphorus and sulfur. It is a material suitable for processes like bending, moderate drawing or forming and welding.

Family C: Casting

Item	Description	Material
C1	Beam Clamp	Malleable Iron Casting Galvanized

Manufacturing process and material: Malleable Iron Casting

Cast iron is a family of metals obtained by mixing iron, carbon and silicon during a casting process. After melting the mix in a foundry, the alloy solidifies as a white iron. Through an annealing heat treatment, the cast material changes the carbon structures obtaining a material that is less hard, with ductile and malleable properties and which still retains a high strength. The chemical composition of malleable iron varies between these values:

Carbon:	2.16-2.9%
Silicon:	0.9-1.9%
Manganese:	0.15-1.25%
Sulfur:	0.02-0.2
Phosphorus:	0.02-0.15%

The malleable iron casting, similarly to ductile iron, is considerably ductile and tough because of the nodular graphite and low-carbon metallic matrix. In addition, malleable iron maintains the properties despite low temperatures. This material is usually used for small castings like brackets, machine parts and electrical fittings like in this case.

6.2.2- Certifications: UL listed

When researching for prospective suppliers for the mentioned products, it must be taken into account that there are some regulations that these components have to comply.

In the area of the electrical products, most of the items are subject to the federal law of the USA. The approval will be received after evidencing that the components meet all the legal requirements of safety, health and environment. The federal law requirements are listed in the National Electrical Code, published by OSHA. This code requires the electrical products to be tested by a recognized, independent safety-testing agency before they can be legally

sold and installed. At the same time, the same authorities nominate the so called “Nationally Recognized Testing Laboratories.

The most famous and recognized Testing Authority is Underwriters Laboratories “UL”. The function of UL is to determine whether a manufacturer has demonstrated the ability to manufacture a product that complies with UL requirements to meet the regulations. A “UL Listed” product has been fully tested and it is considered safe to use.

For this particular research case, the electrical components will be sold in the USA so the suppliers must be certified by UL and able to manufacture “UL listed” parts.

6.2.3- Suppliers research

Once understood the product details, the next step was looking for the suitable suppliers. With the idea of obtaining price quotations from different manufacturers and performing an analysis I had to do a research of suppliers with the capabilities to produce the list of items. To get a general idea of different outsourcing costs, I contacted suppliers from:

Europe: Austria, Czech Republic, Hungary, Italy

America: United States, Canada and Mexico

Asia: India, Vietnam and Taiwan

I could finally obtain a list of 50 suppliers (Appendix 1) that offered similar products and announced the desired capabilities. Mainly, to perform my research I used the following resources:

- Business to business supplier networks: Alibaba, IndiaMart, Fobsupplier, ThomasNet, TradeIndia.
- Trade databases: Zepol, Import Genius.

- Similar products research: looking for catalogues with products with similar features to the Garvin ones (material, certifications and production process) and investigating the manufacturer after.

6.2.4- Contacting the suppliers

In order to contact the suppliers asking about their capabilities and best prices, I had to create a Request For Quotation (Appendix 2). Sending this formatted document is a common procedure to begin a sourcing process and the RFQ must include all the details of the process as well as details of the company, products and legal implications.

Once approved by Garvin Industries and Professor Shields, I emailed the RFQ to the whole list of suppliers, adding the specific details and blueprints of the products that each manufacturer seemed to be capable of producing. During a period of three months, my main research activity was to keep in touch with the manufacturers, answer questions related to the products or the process, follow up the quotations and provide extra information.

The contacting stage was helpful to acquire a general idea of global sourcing procedures and understand some insights of the industry in each country. According to my experience, it is worth to highlight certain some facts that I could observe:

- Despite sending a serious RFQ from a US company that can be easily verified and using a corporative email address, less than 50% of the companies replied to me. In some cases, I emailed directly the sales person but got no response. More concretely, I could notice that it is very easy to find small companies and workshops in countries like India or Taiwan using supplier websites like TradeIndia, but once I had their contact details it was almost impossible to get a response. At least in the

case of this project, I could realize about the importance of the task of agents or companies with experience and expertise in certain areas and able to connect you to the adequate manufacturers.

- On the other hand, the companies from USA, Mexico and Europe were much more efficient giving feedback and replied faster generally.

- I think that the website of Garvin Industries, where it can be easily found the selling price and features had a negative effect on the success of my data collection; some suppliers did not quote or quoted only few products because after checking the currents selling costs, they felt that could not be competitive.

- Another fact that was evident but not surprising, was the ease to find a big number of Chinese suppliers, most of them concentrated in two or three provinces, in the case of the electrical products mainly from Zhejiang and Guandong. I did not contact other Chinese companies because Garvin Industries already has an exclusivity contract there. Nevertheless, through my research I could easily notice how powerful are the business-to-business platforms in this country to find and contact Chinese manufacturers.

- Without considering the costs, the low-cost manufacturers from Asia represent important challenges related with quality. The UL certifications required to trade in the US are widely extended over the world and it's easy to find UL listed products from North America, Europe and also China, industrialized and experienced regions. However, in some of the rising industries from countries like India or Vietnam it is harder to find certificated suppliers, what adds uncertainty and complexity to a prospective sourcing in these countries.

6.3- Case Analysis

After contacting the suppliers, I could get some suitable responses. I received reliable price quotations from manufacturers from four different countries, which hopefully represent the groups and alternatives that I explained in the chapter 5. Garvin provided me with their current costs from China, and I could obtain quotations from India and Vietnam (two of the rising competitors in Asia featuring cheap labor costs) and USA and Mexico (the manufacturing rising stars of the reshoring phenomenon).

Since there were several products and not all the suppliers quoted the same parts, in order to compare the costs and protect the confidential data from Garvin, I decided to scale the price levels. Using the current costs from China as a base of 100%, I estimated for each quoted product the percentage relative to the Chinese figures. Once I had all the prices scaled relatively to the current costs, I estimated the average relative cost for suppliers of each country compared to China. The results are shown in the chart below:

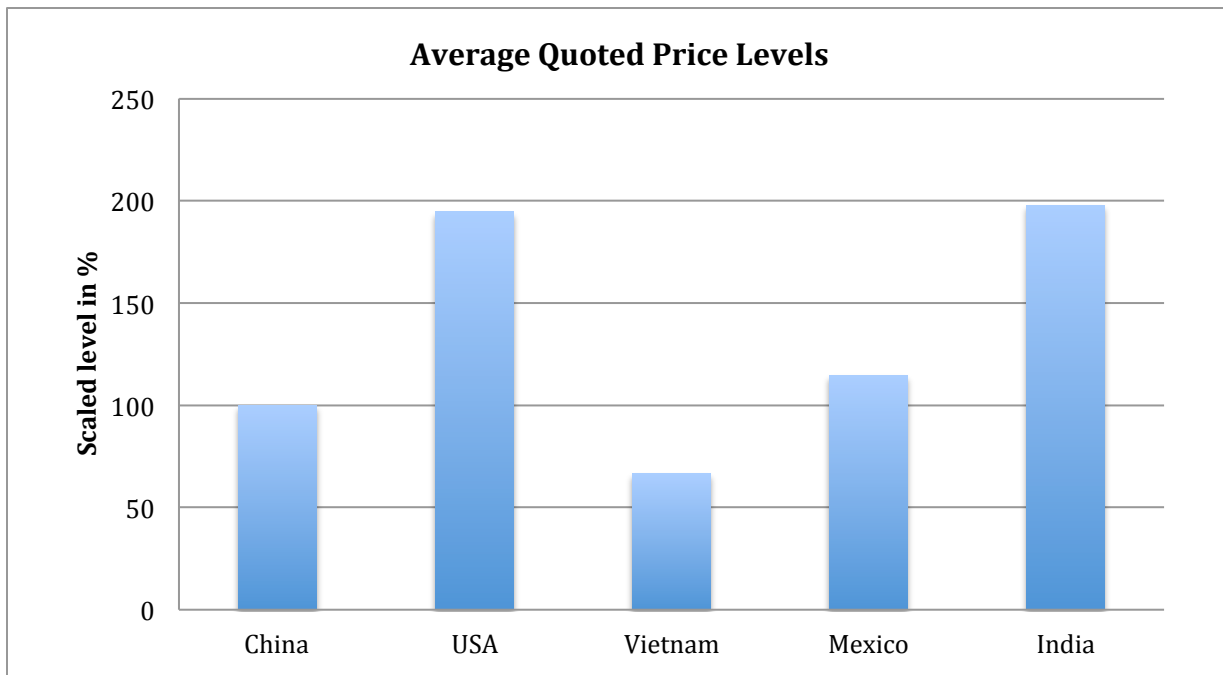


Chart 10: Average Quoted Price Levels

All the suppliers quoted the required unit price, which included the cost of the part plus the transportation to the shipping port according to the terms of Free On Board incoterm (FOB). Therefore, the posterior transportation, insurance and customs are costs that will be added after and will increase the cost paid by the final buyer. The most remarkable points of this analysis are:

- With similar transportation costs to Chinese, and with lower manufacturing costs, Vietnam proves to be the cheapest option. The extreme competitiveness of Vietnam explains the foreign direct investment that is taking place in this country. However, considering that it is a surging industry, the lack of expertise and qualified suppliers and workforce might imply future problems of quality and availability.
- Mexico has very similar production costs to the Chinese ones. However, if we consider the total costs and advantages of production in Mexico, it seems possible to affirm that Garvin would highly benefit from moving capacity to Mexico, obtaining overall lower costs. The Mexican prices reinforce the idea of the future of this country as the future cheap producer for US market, surpassing China.
- The US production costs are on average almost double as Chinese. However, I found out the disparity among costs from diverse US companies. I could obtain both; cheaper prices than in China, but also rates that were more than triple of the current costs. I reckon that the advanced machinery can provide high productivity and the cost competitiveness of US companies relies highly on extremely productive automated processes and economies of scale. Therefore, the manufacturers that possess the required equipment can steal market share from Chinese producers, but old-school US factories will not be able to compete against them.

- Finally, the case of India displays an unexpected value that could have two different explanations. First of all, since I could only obtain one quotation from India for the malleable iron beam clamp, it is reasonable to think that the data set is not large enough to be representative. Nevertheless, thinking about the manufacturing in India, it could also be possible that as mentioned before, the industry is very competitive in certain sectors like textile, but not in the manufacturing of metal parts that require specific machinery and procedures in addition to labor force.

Considering the insights of Garvin Industries, after analyzing the main alternatives and researching on their unique case, I suggest that the best option is to get new suppliers in Mexico because of these main reasons:

- Garvin is currently outsourcing the production from China but does not own facilities there. In addition, Garvin is not serving the Chinese market so would not benefit from its increase. With the progressive rise of costs, China is not anymore the cheapest option and since Garvin does not have capital invested there, I would recommend moving to a new location.
- Despite being the cheapest option, Vietnam does not have a completely developed industry and it is a risky alternative. The costs are rising at a fast pace in Vietnam and even if they are still far away from Chinese levels, it is difficult to know for how long will this country remain on top of competitiveness. Moreover, the probable problems with quality and availability related to a young industry don't seem compatible with a company like Garvin, which serves high quality products for the demanding US market.

· As mentioned in the chapter 5, the latest shifts have made of Mexico the perfect location for cheap production for US companies. The products of Garvin are not complex high technology components since metal parts shaped with different procedures can't be considered complex. Because of this, the US is not as competitive as Mexico due to the higher labor costs. Therefore, considering that the global cost offered by Mexican suppliers is cheaper than the one offered by Chinese ones, and also taking into account the amount of advantages of sourcing from a closer supplier, I think that Mexico is the best option.

7- Conclusions

After researching on the manufacturing in China and working on the case of Garvin Industries during the development of my project, I have acquired a global overview of the situation. The main conclusions that I reached are stated below:

- The excellent performance of the Chinese industry has boosted the economy and the development of the country. This development has enabled the transition of China from a manufacturer to a consumer, and has implied changes in many factors that have finally increased the cost of manufacturing in China.
- Along with shifts in China, changes worldwide have reshaped the world of manufacturing. The US and Mexico, along with other Asian low-cost manufacturers are likely to absorb the production going away from China.
- The latest facts have affected the industries differently depending on each unique situation. Despite having common implications, each industry and case should be analyzed in detail and might have different solutions.
- The case of Garvin Industries is a good example of the changing manufacturing world. Considering all the variables, I have concluded that sourcing from Mexico should be the best option to maximize future results.

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Chart 3. Yinhua Mai and Xiujian Peng, *Estimating the Size of Rural Labor Surplus in China- a dynamic General Equilibrium analysis*

Chart 4. National Bureau of Statistics

Chart 5. Bloomberg and Google Finance

Chart 6. National Bureau of Statistics & Google Finance

Chart 7. Barchart

Chart 8. Boston Consulting Group, *The shifting economics of Global Manufacturing*

Chart 9. China Labor Bulletin

10- Appendix 1: Final list of prospective suppliers

COMPANY		MANUFACTURING CAPABILITIES		
Manufacturer	Country	Stamping	Wire forming	Iron Casting
Rejlek Metal & Plastics Group	Austria	Yes		
ABMTool	Canada	Yes		
Chrudim Iron & Steel	Czech Republic			Yes
Rejlek Metal & Stamping	Hungary	Yes		
Rajneesh Cast Alloys	India			Yes
Patton	India			
Khodyar Engineering & Foundry	India			Yes
Somson Industries	India	Yes		
Ambica Engineering	India	Yes		
DKNV Engineering Private Limited	India	Yes		
Honest Metal Industries	India	Yes		
Myco Industries	India	Yes		
R.M. Engineering	India			Yes
SVVT Press & Structural fabricators	India	Yes		
The U.P. Industrial Agency	India	Yes		
Zaral Electricals	India	Yes		
Ajmeriflex	India			
Flex Tubes	India			
ModernFlex	India			
Technoflex	India			
Steelmark Conduit Enterprises	India	Yes		
ABB Spa	Italy	Yes	Yes	Yes
Estampados Monterrey	Mexico	Yes		
Manufacturas Estampadas	Mexico	Yes		
Manufacturasta	Mexico	Yes		
Articulos metalicos de cadereyta	Mexico			Yes
Blackhawk de Mexico	Mexico			Yes
Estampados y Electrosoldados	Mexico	Yes		
Cadisa	Mexico	Yes		
Builders Brass Wolks de Mexico	Mexico			Yes
Cast Metals foundry	Mexico			Yes
Manufacturera Goertzen Y Asociados	Mexico	Yes		
Ellwood Group	Mexico & USA	Yes	Yes	Yes
Ritec Enclosures	Taiwan	Yes		
Broadlake Co., Ltd	Taiwan	Yes	Yes	Yes

Waukesha Metal Products	USA	Yes		
Microphoto	USA	Yes	Yes	
Pacific Metal Stampings	USA	Yes	Yes	Yes
Arcade Metal Stamping	USA	Yes	Yes	Yes
FotoFab	USA	Yes	Yes	
Bernier Cast Metals Inc	USA			Yes
Benton Foundry	USA			Yes
MES sourcing assitant	USA			Yes
Fisher Barton	USA	Yes	Yes	
Die Makers manufacturing	USA	Yes	Yes	Yes
Great Lakes Pressed Steel Corporation	USA	Yes		
Hanoi Hung Ahn Co, Ltd	Vietnam			Yes
An Phuc Electrical Equipment Company Limited	Vietnam	Yes	Yes	Yes
Cat Van Loi Industrial Electrical Equipment Company	Vietnam	Yes	Yes	Yes
Vietnam Cast Iron	Vietnam			Yes
Itecco Company Limited	Vietnam			Yes
Tian-You Precisiion	Vietnam	Yes		

11- Appendix 2: Request For Quotation Template

Garvin Industries
3700 Sandra Street
Franklin Park, IL 60131
Ph: 847-455-0188 / fx: 847-
455-0334

April 24, 2015

Request for Quotation – Garvin Industries

Dear Sir or Madam,

Garvin Industries is sending a RQF to evaluate suppliers. We are contacting you to obtain important information about your manufacturing capabilities and obtain price estimates, and we would appreciate your prompt response in order to evaluate a possible future collaboration.

Garvin Industries is a 120-Year-Old, privately owned manufacturer of electrical, low voltage and lighting products. We operate in the Greater Chicago Area (Illinois) with our headquarters located in Franklin Park, IL. We serve high-quality UL-listed products to electrical distributors and contractors in the US.

Introduction and purpose of the RFQ

With this RFQ we request information regarding your company and your products/services. The same information will be gathered from different companies and will be used to evaluate which suppliers we will follow up with in the sourcing process.

Process

The supplier selection process will be undertaken as follows. This RFQ will be sent to a group of potential suppliers. Suppliers must prepare a formal response to be sent to the contact provided by Garvin. The responses will be reviewed and evaluated against a set of pre-defined criteria in order to select suitable suppliers. The selected suppliers will be notified and invited to take part in the next stage of the process, providing further information and pricing in order to negotiate future business.

All the responses will be sent before: [May 11, 2015](#)

All the responses as well as questions will be sent to:

Oriol Pesa
purchasing@garvinindustries.com

Products

We are currently looking for suppliers for the products listed below. You will also find the blueprints and estimated annual order quantities.

5x Electrical Junction Boxes

Material: **Steel -0.0625"-G60 Galvanized**

Manufacturing process: **Stamping**

Certifications: **UL listed**

Item details:

REF: 52151-MS (90,000 units/year)

· 4" Square box, 1-1/2" Deep with a metal stud bracket → (4) 1/2" & (5) 1/2"-3/4" Side Knockouts and (3) 1/2" & (2) 3/4" Bottom Knockouts

REF: 52171-SWB (80,000 units/year)

· 4" Square box, 2-1/8" Deep with a wood spike vertical bracket → (4) 1/2" & (5) 1/2"-3/4" Side Knockouts and (3) 1/2" & (2) 3/4" Bottom Knockouts

REF: 54151-1/2 (120,000 units/year)

· 4" Octagon box, 1-1/2" deep → (4) 1/2" Side Knockouts and (5) 1/2" Bottom Knockouts

REF: G19282 (60,000 units/year)

· Handy Utility box, 2-1/8" Deep → (8) 1/2" Side Knockouts and (2) 1/2" Bottom Knockouts

REF: G601-OW (100,000 units/year)

· Deep Switch Box, 2-1/2" Deep → (6) 1/2" Side Knockouts and (2) 1/2" Bottom Knockouts

2x Covers for the Electrical Junction Boxes

Material: **Steel -0.0625"-G60 Galvanized**

Manufacturing process: **Stamping**

Item details:

REF: 52C6 (120,000 units/year)

· 4" Square flat cover → 1/2" Knockout

REF: G19290 (160,000 units/year)

· Handy Utility box cover

Certifications: **UL listed**

J Cable Support Hook

REF: JHK-32 (200,000 units/year)

Material: **Steel-0.047"- G60 Galvanized**

Manufacturing process: **Stamping**

Certifications: **UL listed**

Standard Bridle Ring

REF: BR-200 (200,000 units/year)

Material: **Steel C1008-C1018 -Zinc plated**

Manufacturing process: **Wire forming**

Item details:

- 2" Loop size → 1/4-20 Threaded Leg

Certifications: **UL listed**

Beam Clamp

REF: MBC-1420 (600,000 units/year)

Material: **Malleable Iron**

Manufacturing process: **Malleable Casting Galvanized**

Item details:

- 7/8" Jaw Opening and (2) 1/4-20 UNC-2B Threaded Holes

Certifications: **UL listed**

Flexible conduit for wiring assemblies

REF: PWHP-3A (50,000 units/year)

Material: **ZAMAK 3 + G60 Galvanized Steel (couplings)**

Manufacturing process: **Corrugated Steel Tubing – Roll form**

Certifications: **UL listed**

Transportation procedures

We are currently working with standard shipping terms of sale: F.O.B Destination, Freight Prepaid

Information Required

1. Do you have the suppliers and machinery needed to manufacture the products listed above?
2. Do you manufacture products listed by UL (Underwriters Laboratories)?
If the answer to the previous questions is YES, continue
3. Do you have experience supplying US buyers?
4. Which shipment methods are you currently using?
5. Price estimates:
 - Estimated price per unit (for each suitable product)?
 - Tooling costs (if required)?

Confidentiality

All information included in this RFQ is confidential and only for the recipient knowledge. No information included in this document or in discussions connected to it may be disclosed to any other party.