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Reverse Innovation and Italian Multinational Corporations in China: A Case Study in the Italian Mechanical Sector

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Abstract

The development of China and India is redrawing the global flow of innovation. Some large Western MNCs are changing their behavior towards these new protagonists of the world economy. General Electric, PepsiCo, Logitech, and others are developing new innovations within China and for Chinese people. In this way, these companies have been able to penetrate the local emerging market, characterized by less purchasing power, but at the same time, by a much larger consumer base. Subsequently, the same products have been transferred to the industrialized world as such, or with minimum modification, conquering low-market segments, or directly creating new markets with these emerging economies' innovations. This represents a reversal of the global innovation flow, which up to recent years was characterized by Western MNCs innovating for Western citizens and then trying to sell the same innovations in emerging economies.

Given these changes in global innovations flows, this dissertation has taken under scrutiny Italian companies operating in China through a case-study methodology. It applies the Reverse Innovation paradigm to those enterprises part of the mechanical sector, one of the most successful and most representative of the Italian economy. In addition, the companies analyzed have an important difference compared to past research. They are much smaller in size than those international giants studied in light of this phenomenon.

Notwithstanding the difference in size, this dissertation finds out that Italian companies, albeit differently, are pursuing Reverse Innovation. They introduce new products according to Chinese needs, which subsequently are sold as such in industrialized economies. Thus, it demonstrates that Reverse Innovation in the Italian mechanical industry, even for smaller companies, is feasible. Furthermore, another important finding took place for what concerns the case-study of an Italian company

manufacturing agricultural machineries. There are, in fact, some industry-specific factors that may hinder the possibility of Reverse Innovation.

Keywords: Reverse Innovation, China, Italy, Mechanical Sector, MNCs

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Abbreviations

GDP – Gross Domestic Product

PRC – People's Republic of China

WTO – World Trade Organization

MNC – Multinational Corporation

R&D – Research and Development

CCP – China's Communist Party

FYP – Five Years Plan

SOEs – State-Owned Enterprises

FDI – Foreign Direct Investment

ICT – Information and Communication Technologies

GVC – Global Value Chain

GE – General Electric

SMART – Simple, Maintenance-Friendly, Affordable, Reliable, Timely-to-market

HQ – Head Quarter

EV – Electric Vehicle

1. Introduction

1.1 Thesis Introduction

The fast-growing rates of emerging economies such as China and India are bringing drastic changes to the current economic system in many respects. Nowadays, the emerging countries represent, in fact, the engine of growth of the world economy, and this has clear implications in the managerial and political world. Differently, industrialized economies, especially after the crisis that hit them in 2008, are still struggling to return to pre-crisis levels of GDP growth, and in consequence, the idea of a catching-up from developing countries is becoming more concrete than ever.

In the case of China, the role of the Chinese Communist Party in creating a welcoming environment for Foreign Direct Investments has been undoubtedly a key for triggering the economic development, especially since the economic reforms proposed by Deng Xiaoping in the 1980s. Opening the borders of the PRC to the world economy, in fact, has proved extremely successful [1]. In the first stage, numerous multinational corporations have decided to relocate the production in the Celestial Empire, in order to reduce the costs of their products, exploiting the competitive advantage present at the time. Subsequently, with the entrance of China in the WTO in 2001, economic exchanges between the Middle Kingdom and the world have spurred once again, up to nowadays, where China represents the most important trading partner of the world economy[2].

The importance of the Asian country and other emerging economies has led multinational corporations to change their behavior towards these new protagonists of

[1] L. Brandt et al., "China's Great Transformation", (Cambridge: Cambridge University Press, 2008), p. 11.
[2] J. Li, "China now the world's top trader", China Daily, March 2, 2014, Accessed March 7, 2021. http://www.chinadaily.com.cn/business/2014-03/02/content_17316163.htm

the global economic system. The world of innovations is one perfect example in which a change is taking place. In the past, multinational corporations used to innovate in their home country, with the objective of achieving high rates of sales within the country of origin. As explained by Raymond Vernon in the Product's lifecycle[3], there are several considerations that lead the MNC to first, listen to local needs and provide a new product that could meet those necessities. In subsequent stages, the same products could generate demand abroad, and these would be firstly exported, and then, after a cost-minimization consideration, a Foreign Direct Investment could have taken place. Nevertheless, despite being exported, the innovation has been rarely based on necessities of other countries' population. Daniele Archibugi and Jonathan Michie as well, in their paper published in 1995, did not take into consideration the possibility of Reverse Innovation and the powerful inputs that might erupt from emerging economies when speaking about what they call "techno-globalism". Rather, the most recurrent episode of globalization of technology at the time was "the international exploitation of inventions developed within each nation"[4], something resembling the Product's Lifecycle.

In consequence, when Western MNCs do not satisfy those needs, thanks to the industrialization that is taking place in those emerging economies, new powerful local actors will fill the gap through their own innovations. MNCs such as Huawei, Xiaomi and Haier are just a few of the many business entities that are thriving not only locally, but are able as well to conquer Western markets with their innovative solutions, sometimes even disruptive[5][6]. Thus, to keep their market positions, nowadays, Western MNCs are changing their behavior, starting to shift the focus on those emerging

[3] R. Vernon, "International Investment and International Trade in the Product Cycle", The Quarterly Journal of Economics, 1966, 80(2): p. 190-207.
[4] D. Archibugi and Jonathan Michie, "The globalisation of technology: a new taxonomy", Cambridge Journal of Economics, 1995, Vol. 19(1), p.121-140: 138.
[5] C. Christensen, M. Raynor, and R. McDonald, "What is Disruptive Innovation?". Harvard Business Review 3, 2015.
[6] C. Hang, J. Chen and A. M. Subramian, "Developing Disruptive Products for Emerging Economies: Lessons from Asian Cases", Research- Technology Management, 2010, vol. 53(4), p. 21-26.

economies which have a fast-growing middle-class, ready to spend money on new solutions. This phenomenon represents a new contemporary trend that is changing the world of international investments. The consequence of not pursuing this strategy in fact, would exclude Western companies from an extremely profitable market, the market of emerging economies such as China and India which together alone represent the 36% of world population[7].

1.2 Research Topic

A famous scholar who has become extremely popular worldwide for his idea is Vijay Govindarajan. He found out that some Multinational companies are doing what he calls "Reverse Innovation". Both local or Western MNCs can embark in this process, and it has proved to be extremely beneficial for those actors part of this group. Briefly speaking, Reverse Innovation involves companies to innovate according to the needs of emerging economies, for then transferring these products to industrialized markets. Especially, the majority of cases recorded up to now have been about extremely large MNCs such as General Electric, PepsiCo Procter & Gamble, Siemens, Philips and so on, which have innovated for fast-developing countries like China and India.

By researching and developing their products in and for those countries, the results have been beneficial in two ways. First, you increase the rates of sales in the emerging economy; second, you can sell the same product with these characteristics in the West, targeting low-market segments or creating new markets in the industrialized world, reversing, in this way, the traditional flow of innovations. Following this introduction from Govindarajan, other scholars have decided to study this phenomenon, enriching the literature with case studies, or through enlargements of the concept. To mention

[7] United Nations, "World Population Prospects 2019", Department of Economic and Social Affairs Population Dynamics, 2019. Accessed February 25, 2021. https://population.un.org/wpp/Download/Standard/Population/

some examples, General Electric has successfully developed a cheap portable ultrasound system that met the needs of rural clinics in China. The same product has been successful in the West, despite being created exactly for the Celestial Empire's characteristics. Logitech faced an extremely fierce competition in China against local providers of mouse for computers. In consequence, they decided to provide a product which could have met the needs of the local economy, which was much cheaper, but at the same time had all the functionalities required to be sold successfully. The same mouse has been transferred to Western markets with success[8].

These are just two of the cases taken under scrutiny up to now, and each of these episodes shows the importance that MNCs are nowadays giving to emerging economies, not only as simple recipient of already-successful innovations marketed in the West, but instead, as the primary market for a set of new products. Thus, Reverse Innovation is a new concept that should be taken carefully under consideration by all those MNCs which have a presence in these emerging economies like China. In fact, creating new products for those countries, has already been proved as beneficial, and it should lead every MNCs to behave in such a way.

1.3 Research Question

Among the number of cases conducted up to now, as mentioned above, the majority of them have concentrated on those extremely large MNCs which have a well consolidated international presence. Differently, Italian companies residing in China have not been yet extensively investigated. The most prominent scholar who comes to mind is Simone Corsi et al., who, with his academic piece, has conducted a case-study analysis of a mid-sized Italian company residing in China called Speres[9].

[8] V. Govindarajan and C. Trimble, "Reverse innovation: Create far from home, win everywhere." (Boston: Harvard Business Review Press, 2012).

[9] S. Corsi, A. Di Minnin and A. Piccaluga, "Reverse Innovation at Speres: A Case Study in China", Research-Technology Management, 2014, 57(4), p. 28-34.

With this dissertation, the objective is to illustrate more cases concerning Italian companies in China, especially those part of the mechanical sector. This sector is one of the most successful in which Italian companies operate. Here, Italian enterprises need to constantly improve their technologies in order to win the fierce competition. Up to now, they have been able to maintain the market position. However, given the importance that Reverse Innovation has gained recently, given the focus on emerging economies from large MNCs, it is needed to conduct an analysis on the activities of Italian MNCs in countries like China. Moreover, the companies under scrutiny in this research have another important characteristic that differentiate them from past studies. They have a much smaller size than companies studied up to now. Thus, this difference in size may impact the likelihood of pursuing Reverse Innovation.

Given the differences present in Italian companies compared to studies conducted up to now, given the fact that a research concerning the Italian mechanical sector, one of the most successful ones for the Italian economy, in light of Reverse Innovation has not yet been conducted, this dissertation will provide new insights for this category of enterprises. In addition, it will make use of the linear framework developed by Corsi[10] to provide a definition to different types of innovations that have been developed for the Chinese market and, in this way, understanding whether they can be labeled as Reverse Innovations.

The research question to which this dissertation answers is: "Is Reverse Innovation feasible for the Italian Mechanical Sector?" and "how do Italian mechanical companies engage in Reverse Innovation?". In addition, thanks to the case-study methodology used in this research, it will be possible to understand whether there are new conditions that facilitate or hinder the process of Reverse Innovation, namely, introducing new

[10] S. Corsi et al., "A Typology of Reverse Innovation", Journal of Product Innovation Management, 2015, 32(1), p: 12-28: p. 16.

innovations in emerging economies and bringing them back in the domestic industrialized market.

1.4 Methodology Overview and Thesis outline

The methodology of this research is based on a case-study approach, as mentioned by Eisenhardt, it is "a research strategy which focuses on understanding the dynamics present within single setting"[11]. As advised by the author of the article, this paper has provided a broad definition of the research question. This specification a priori of the construct shapes the initial design of the research. However, what is argued by Eisenhardt is that these pre-determined bases may not have a place in the final result of the paper. Through the analysis of the case-study, many new interesting facts might come out that have the risk of disrupting the initial assumptions[12]. Stake as well, one of the most prominent case-study researchers, pushes the idea of a flexible design. The initial design, for the scholar, concerns the issues and issue questions. The researcher should need some issue questions that will help structuring the observation, interview, and document review. This flexibility represents the adoption of the idea of progressive focusing, which means that the more you conduct your study, the more the problem areas become clarified and redefined. Since the topic under scrutiny is quite new and has not been too extensively researched, a flexible approach might be helpful for the purpose of this paper. Yin, differently, is the leading advocate of a well-structured case-study approach. "From a Yinian perspective, case study research design is comprised of five components: a study's questions; its propositions, if any; its unit(s) of analysis; the logic linking the data to the propositions; and the criteria for interpreting the findings."[13] These components need to be cohesive and consistent

[11] K.M. Eisenhardt, "Building Theories from Case Studies Research", Academy of Management Review, 1989, 14(4), 532-550: p. 534.
[12] Ibid.
[13] B. Yazan, "Three Approaches to Case Study Methods in Education: Yin, Merriam, and Stake", The Qualitative Report, 2015, 20(2), p. 134-152: 140.

among them. The fourth and the fifth are the ones which deserve more attention. In addition, he emphasizes the importance of reviewing the literature and including theoretical propositions which concern the case under study before the collection of data. Moreover, a considerable emphasis should be placed on the preparation of the research, and this framework should be, at maximum, slightly altered after beginning data collection[14].

Given the conflicting views of the case-study approach, this research is a mixture of the above-mentioned methods. It has a general framework and a theoretical background. The research will be conducted with in mind the characteristics peculiar to Reverse Innovation theory: the development of new innovative products or features first marketed in emerging economies (in this case China) and then the marketization of these new innovations in the domestic market. Despite having some examples of successful cases of Reverse Innovation provided by various scholars, new important discoveries might take place in the conduction of the analysis and interviews. For instance, new reasons that hinder or facilitate the process of Reverse Innovation that had not been mentioned by previous studies might be evident.

The whole research, thus, has been conducted as follows. First of all, through the website of the Chamber of Commerce of Italy in China and the Italian Trade Agency, information has been gathered regarding Italian companies and institutions present in the Chinese territory. Especially, an important public document released by the ITA (Italian Trade Agency) has provided the researcher with a list of all Italian companies and institutions present in China.[15] Through a careful analysis of the list, the companies considered more suitable for the research have been short-listed. From this, a desk analysis of the companies' profile has provided the information necessary to

[14] R. K. Yin, "Case Study Research: Design and Methods", Third Edition, (London: SAGE Publications, 2003)
[15] Italian Trade Agency, "Aziende e Istituzioni Italiane in Cina", , accessed February 25, 2021. https://www.ice.it/it/sites/default/files/inline-files/aziende%20italiane%20in%20Cina.pdf

establish the units of analysis, namely, those companies which have an R&D center or a productive site in the Asian Country, part of the mechanical industry. Having chosen the companies, a careful examination through different sources has taken place. First, on each company's webpage are available several documents which provide a general description of the activities of the company, the products it offers, and the various branches the business entity possesses around the world. Moreover, additional useful information on the enterprises has been retrieved through online platforms such as Factiva, a website owned by the Dow Jones which stores all the news from licensed and independent sources of information. To quote the website, Factiva "rely on an unrivaled selection of global news and data accessible via a powerful research platform, on mobile devices or integrated via advanced feeds and APIs"[16]. Another important source of information from which documentation has been retrieved is Orbis, Bureau Van Dijk's company database. It is a Moody's analytic company, and it is the biggest database in the world with data of all the companies with an international presence. According to the website, there are information about 400 million companies. It is the most complete resource of public traded and private companies. It stores information from 170 different international providers and other hundreds of internal sources.[17] Moreover, important business-related Italian newspapers have been consulted, from Il Sole 24 Ore, the most important journal in this field present in the Italian territory[18], to Milano Finanza. After a careful analysis of the companies through these sources, the second step, which involves semi-structured interviews, has taken place. Thanks to websites such as LinkedIn and Rocket Reach, together with phone calls to the main branch in Italy, the researcher has been able to contact managers of those companies. It has been understood through the whole analysis coupled with conversations with

[16] Factiva, "Factiva and Curation Services", Dow Jones, accessed March 7, 2021, https://professional.dowjones.com/factiva/
[17] Bureau Van Dijk, "Orbis Overview", a Moody's analytic company. Accessed March 7, 2021, https://www.bvdinfo.com/it-it/le-nostre-soluzioni/dati/internazionali/orbis
[18] Prima Online, "Dati Ads: diffusione e vendita a dicembre di quotidiani e settimanali, a novembre dei mensili (TABELLE)", February 7, 2019. https://www.primaonline.it/2019/02/07/284551/ "Prima Online", Accessed March 29, 2021.

these high-ranked people whether there are any products which are first introduced in an emerging economy such as China which then complete the Reverse Innovation process by being marketed in the West.

2. Literature Review

2.1 Background

2.1.1 China's opening to the World Economy

China is one of the countries which have achieved the fastest economic development in modern history. The astonishing rates of growth have led development scholars to study the Chinese approach to find some answers for its success. Some have argued that the particular characteristics of China might be labeled as developmental state. This is conceived by J.B. Knight as the fulfillment of two particular attributes: a government which gives uncontested priority to economic growth, and that the "governance should be incentivized to achieve that objective"[19]. Breslin instead has labeled it the "China Model". This is not seen as a particular approach as defined by other scholars, rather, he argues that the China model simply consists of following your own path departing from your peculiar characteristics, without relying on foreign ideologies. Thanks to this approach, China was able to set clearly national economic objectives of the country, to pursue development on specific sectors commanded by the CCP and protect them from foreign intrusions, and the use of financial institutions for nation building and economic development[20]. Joshua Kooper Ramo coined the term Beijing Consensus which stands in contrasts with the Washington Consensus, a model of development advocated by neoliberal thinkers which argued for a complete deregulation of the market and pushed the idea that the state should never intervene in the economy. The Beijing Consensus, according to the scholar, does not deny the intervention of the state in the economy and the society, and puts emphasis on the undisputed sovereignty of every nation, being them small or big[21].

[19] John B. Knights, "China as a Developmental State", The World Economy, 2014: 1335-1347.
[20] S. Breslin, "The "China model" and the global crisis: from Friedrich List to a Chinese mode of Governance?", International Affairs, 87(6), 2011: 1323-1343.
[21] Joshua K. Ramo, "The Beijing Consensus", Foreign Policy Center, 2004.

Despite the presence of different labels for the Chinese-style approach to achieve economic growth, what is widely shared by the academic community is that the governmental apparatus has a strong influence on the direction of the Chinese economy. This particular feature, which is being highly criticized by Western leading countries due to the protectionist nature, has been widely used by the majority of countries in their early stages of development. Ha-Joon Chang points this out in his paper, arguing that countries such as the US and Great Britain, the ones which are considered the best representation of free-market, are actually the countries which have used more extensively protectionist measures during their history. In fact, he quotes the scholar Friedrich List, emphasizing that the way in which such countries are behaving is like "kicking away the ladder" with which they climbed to the top[22].

Since the foundations of the People's Republic of China, the strong decision-making power of the state in establishing the direction of the economy has been represented by the various comprehensive policies such as the Five-Year Plan. These are policies promulgated every 5 years, as the name can suggest, which set overall objectives for the whole country to be achieved. The CCP is still issuing Five-Year Plans nowadays, as a matter of facts, the government is currently implementing the 14th FYP which will last from 2021 to 2025[23]. Another example of the strong influence of the government in the direction of the economy is the recent policy called Made in China 2025, a strategic plan with the aim of developing further the manufacturing sector of the PRC, transforming it from labor-intensive to more technology intensive.

After its foundation, China's organizational structure resembled the characteristics of the Soviet Union. Heilmann lists some of the features which have persisted up to nowadays in the Chinese system, these remain at the basis of the Chinese constitution:

[22] H. Chang, "Kicking Away the Ladder: How the Economic and Intellectual Histories of Capitalism Have Been Re-Written to Justify Neo-Liberal Capitalism", Post-autistic Economics Review, 2002, 15(3).
[23] Xinhua News, "China proposes development targets for 14th Five-Year Plan period", Xinhua News, October 29, 2020, accessed November 9, 2020,

"the leading political role of the CCP; the comprehensive powers of the central government to intervene with respect to the regional leadership; a concentration of power; and subordination of individual rights to collective interests"[24]. These key points listed by the German scholar highlight the extremely powerful leadership of the party. This governmental framework gives the CCP the power to completely revolutionize the economy whenever it considers it necessary. Something that happened in the late 70s.

From the creation of the People's Republic of China up to 1978, Chinese economy followed the path of the Soviet Union. The lapse of time in which Mao was the paramount leader of the party did not see the Chinese economy thriving. Under the dictates of communism and the command economy, China was able to achieve moderate rates of growth and industrialization, with some drawbacks in the periods of the Great Leap Forward and the Cultural Revolution. These years can be considered as one in which ideology was extremely strong in China, which, sometimes, has prevented the CCP to implement the necessary reforms to revitalize the economy[25]. Nevertheless, the situation changed after Mao's death and the arrest of the Gang of Four by Hua Guofeng which brought to an end to the Cultural Revolution.

In 1978, a new paramount leader took the power on his hands, one of the most influential people on the 20th century who was able to change the face of China and to achieve impressive rates of growth. His name is Deng Xiaoping. As soon as he came to power, many of his fellow comrades, who were removed for not being ideologically pure, were recalled. From then on, discussions about the possibility to implement liberalizations to the economy became the norm. Under the leadership of Deng, China abandoned the complete adherence to communist ideology, instead, he embraced

[24] Sebastian Hailmann, "China's Political System" (Lanham: Rowman & Littlefield, 2017), p. 57.
[25] B. Naughton, "The Chinese Economy: Transitions and Growth" (London: MIT Press, 2007).

pragmatism and implemented the necessary reforms gradually[26]. Reforms touched many sectors of the economy, from agriculture to SOEs, up to the opening of the country to foreign investments. Each of these implementations had important consequences for China, but maybe the most important one was to end the period of self-isolation and the reestablishment of contacts with the world economy. The open-door policy which began in 1979 was pursued in order to import foreign capital and expertise and increase foreign trade to level similar to the West[27]. Three particular implementations were put in place by the CCP: the establishment of a double exchange rate, the reduction of import duties for companies considered to bring technology inside China, and the establishment of four Special Economic Zones in Shantou, Shenzhen, Xiamen and Zuhai[28]. These policies were fundamental for the departure of the Chinese economy, especially, thanks to FDI, Chinese GDP and exports were boosted at unprecedented level, changing the face of the country.

2.1.2 FDI's importance for Chinese Growth

The end of the 20th century has seen the proliferation of numerous Multinational Corporations. They are firms which have operations in two or more countries and are considered the "public face of globalization"[29]. In the years after China's opening of its borders, numerous MNCs entered the country to exploit the labor of Chinese workers, considered much cheaper than Western countries. With many MNCs moving their production to China, possibility of spillover of technologies increased. China's inward FDIs grew at astonishing rates, transforming the country from isolated to the largest recipient of FDI among the developing countries in few years.

[26] Joseph E. Stiglitz, "Globalization and its Discontents" (New York: WW Norton & Company Inc. 2002).
[27] A. Bohnet, Z. Hong & F. Müller, "China's Open-Door Policy and its Significance for Transformation of the Economic System", Intereconomics, 1993: p. 191-197.
[28] G. Huan, "China's Open-Door Policy, 1978-1984", Journal of International Affairs, 1986, 39(2): p. 1-18.
[29] E. Thun, "The Globalization of Production" in Global Political Economy, ed. John Ravenhill (Oxford: Oxford University Press, 2017), 174-195.

Many studies have been conducted to analyze how the economy of China has benefited from these investments. Shujie Yao examined two particular development strategies: the export-push strategy and the assimilation of developed countries' technologies and practices through FDI. By using a dataset for 28 provinces in a period of 23 years, the scholar concluded that both exports and FDI have been crucial for the thriving of the Chinese economy[30]. Chen et al. have studied the role of FDI on China's economic development since its opening-up. According to them, FDIs had brought numerous benefits. They were able to increase the resources available to China for capital formation, they have promoted growth thanks to contributing on China's exports earnings, and that they have increased growth even further in the second half of the 1980s, when China decided to open more areas of its country. Despite some critics have mentioned the proliferation of political and social consequences, such as the growing inequality between inland and coastal provinces, unequal distribution and declining ideology, overall FDIs have been beneficial to China.[31] Sun and Parikh contributed to the literature with their empirical study regarding the impact of exports on economic growth. They found out that export expansion has had a positive effect on Chinese growth and moreover, a positive externality to the non-export sector of China. However, the distribution of benefits has been uneven, with the coastal provinces considered the ones which benefited most. They conclude, nevertheless, that the Chinese experience "confirms that export expansion and inflows of Foreign Direct Investment can play an important role in accelerating economic growth"[32]. Finally, the study of Zhang and Song showed how FDI help to direct capital into industries giving them the potential to be competitive internationally and that the presence of MNCs can be used as a bridge to enter foreign markets. Moreover, thanks to the assimilation of managerial skills coming from the West, FDI increase exports overall. In particular,

[30] S. Yao, "On economic growth, FDI and exports in China", Applied Economics, 2006, 38(3): p. 339-351.
[31] C. Chen, L. Chang & Y. Zhang, "The role of foreign direct investment in China's post-1978 economic development", World Development, 1996, 23(4): p. 691-703.
[32] H. Sun and A. Parikh, "Exports, Inward Foreign Direct Investment (FDI) and Regional Economic Growth in China", Regional Studies, 2010, 35(3), p. 187-196.

their study empirically demonstrated that an increase in 1% of FDI leads to an increase in export of 0.29% the following year. Thus, even in this case, the widespread belief that FDI affects positively exports, and in consequence growth, is supported[33].

Hence, from the literature, it can be concluded that FDI, and with it the increase in exports, have been crucial for China to accelerate economic growth. The policies put in place by Deng regarding the opening-up of China have led the Asian country from self-isolation to a key participant of the global economy and the world's Global Value Chains[34]. With more and more Multinational Corporations deciding to relocate production in the Asian country, providing numerous jobs, especially in the coastal provinces, and managerial skills which have contributed to the increase in standards in the whole Chinese society.

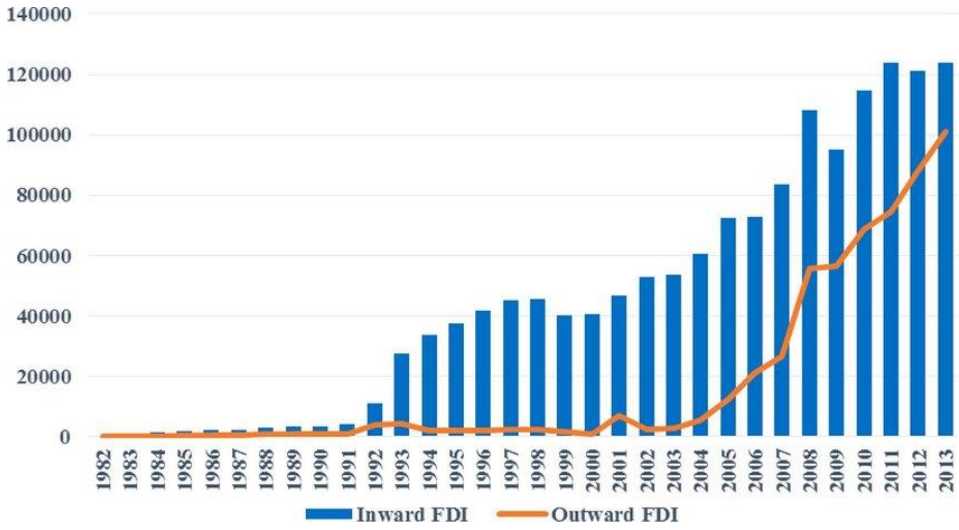

Figure 1: ***Chinese Inward and Outward FDI[35], " Yeoh et al. "China–Malaysia Trade, Investment, and Cooperation in the Contexts of China–ASEAN Integration and the 21st Century Maritime Silk Road Construction"***

[33] Kevin H. Zhang and S. Song, "Promoting exports: The role of inward FDI in China", China Economic Review, 2001, 11(4): p. 385-396.
[34] Brandt et al., "China's Great Transformation": p.11.
[35] Emile K. Yeoh et al. "China–Malaysia Trade, Investment, and Cooperation in the Contexts of China–ASEAN Integration and the 21st Century Maritime Silk Road Construction", The Chinese Economy, 2018 51(4), p. 298-317: p. 308.

2.1.3 China and the Global Value Chain

Undoubtedly, the liberalizations implemented by Deng had a positive effect on the attraction of MNCs in the Chinese territory. Moreover, these came to happen in the time in which globalization was spreading at its fastest speed. Richard Baldwin has labeled this period as the 2nd unbundling.

The ICT revolution, thanks to the development of Telecommunication technologies have led to faster exchanges in communication between distant areas. Activities which once had to be performed next to each other, with these technological developments, could be divided into small parts and distributed around the world, following the dictates of competitive advantages. More importantly, costs of relocating steps of production were almost null[36]. Thomas Friedman with his famous best-selling book "The World Is Flat" provided many examples that represented how countries like China and India have a strong presence in the Global Value Chains around the world. They have become crucial actors for the production of goods that are served to every part of the world[37]. Nevertheless, despite being part of GVC, the risk in which countries such as China incur, is that of being captured into low value-added activities in the production cycle. This is represented by the "smile curve" proposed by Baldwin which shows how, compared to the 1970s, the value added to the product by manufacturing activities has decreased.

[36] R. Baldwin, "Factory-free Europe? A two unbundlings perspective on Europe's 20th century manufacturing miracle and 21st century manufacturing malaise", Graduate Institute, Geneva 2014,
[37] Thomas L. Friedman, "The World Is Flat". (London: Penguin Books, 2005).

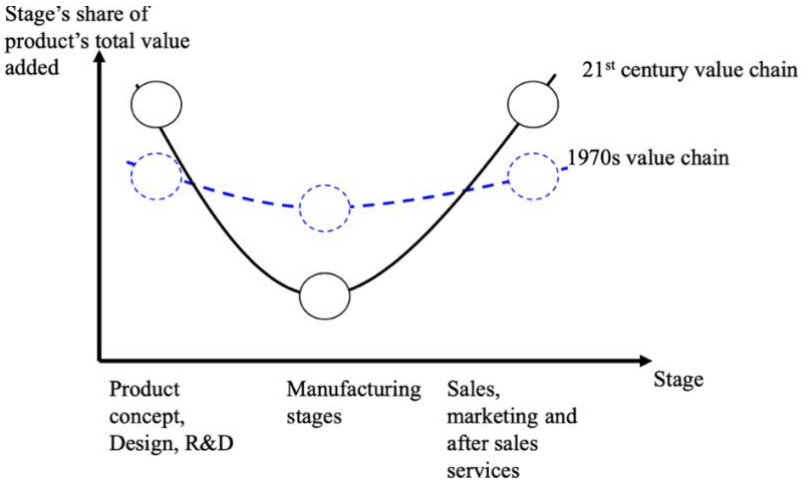

Figure 2: ***The Smile Curve.[38], "Baldwin, Baldwin "Factory-free Europe? A two unbundlings perspective on Europe's 20th century manufacturing miracle and 21st century manufacturing malaise"***

Thus, despite being "the new drivers of the Global Value Chain"[39], China and India, two of the most important host countries for what concerns production, are facing a problem well described by Eric Thun, the scholar has asked "whether they will be able to capture the high value-added activities, or whether they will be trapped into a dependent relationship with multinational firms in which they are limited to low value-added activities."[40] This issue connects well with the theory of Raymond Vernon as well. The scholar, in fact, argues that manufacturing facilities will always seek and shift to the most convenient place[41]. Thus, according to these theories, the Asian country needs to change the face of its economy as countries such as Korea and Japan have succeeded to do. China, considered by many the world's factory, has in fact become the largest manufacturer in the world by far. When developing countries like China are able to enter in the global value chain and to compete with their low-cost labor, incomes start to rise. Therefore, with income rising, firms might decide to

[38] R. Baldwin "Factory-free Europe? A two unbundlings perspective on Europe's 20th century manufacturing miracle and 21st century manufacturing malaise": p. 26.
[39] G. Gereffi and K. Fernandez-Stark, "Global Value Chain Analysis: a Premier", Center on Globalization, Governance & Competitiveness (CGGC), 2011, p.3.
[40] E. Thun, "The Globalization of Production" p. 175.
[41] R. Vernon, "International Investment and International Trade in the Product Cycle".

relocate their production to other developing countries such as Vietnam or Bangladesh or to relocate production sites at home. As a matter of fact, these are phenomena that are already taking place. Thus, it can be concluded that the theories described above provide a reason for China to make a transition to higher value-added activities, otherwise there is the risk of remaining stacked in the family of middle-income countries.

2.1.4 The Importance of Research and Development

As shown by Baldwin, one of the most important value-added activities within the GVC is the Research and Development. This step in the product's life cycle leads to innovation, which is considered as being a crucial element for achieving long-term economic growth[42]. As it happens, R&D has been usually residing in the most developed countries, usually being them the United States or Western European countries. Due to their importance, MNCs have kept the activities of Research and Development closely under control in their own centers. Patel and Pavitt, in fact, showed how countries from the industrialized areas are prone to keep technological development within their borders, arguing that: "the production of technology remains highly "domesticised""[43].

Some scholars have analyzed the impact of R&D in the productivity of firms. The results have been positive and significant, demonstrating the importance of R&D in achieving a competitive advantage. This impact, moreover, increases even more in the case of high-tech industries[44]. The famous paper of Raymond Vernon, instead, gives some reasons for which companies decide to innovate at home: first, the initial target of the new product is the home market, thus innovation at home is conducted to reduce

[42] N. Rosenberg, "Innovation and Economic Growth", OECD 2004.
[43] P. Patel and K. Pavitt, "Large Firms in the Production of the World's Technology: An Important Case of "Non-Globalisation", Journal of International Business Studies, 1991, 22(1), p. 1-21: 17.
[44] R. Ortega-Argilés et al., "R&D and productivity: testing sectoral peculiarities using micro data", Empirical Economics, 2011, 41: 817-839.

transportation costs; second, the specialization of a new product and the way of manufacturing it is not fixed in the early stages; third, initially there is inelasticity of demand in respect to the price of the product, innovation thus, is not dependent on costs, people in the early stage of the product would be willing to buy it independently from the price[45]. Thus, according to this view, innovative products first develop in the industrialized countries, where more technology is present, then, they are exported to developing countries in future periods.

By analyzing the most successful Multinational Corporations, we will see that the majority of them are researching and developing new products at home for then produce them abroad at a lower cost of production in next stages of the product's life. This happens also due to the fact that countries in which R&D is conducted usually have larger amounts of human capital. Whether the new iPhone or the new Nokia, research and development has usually been conducted within the country of origin's borders, with the scope of providing innovations to satisfy industrialized markets' needs. Differently, lower value-added activities are the ones offshored abroad. The study by Ali-Yrkkö et al. of the N95, a phone developed by Nokia in 2007 clearly represents this situation. It showed how the largest value of the phone resided in the hands of the developer Nokia despite the product had the label made in China[46]. What is happening worldwide is that products are first researched and developed at home, thanks to the innovative inputs of local engineers and researchers, then they are standardized, and great quantities are produced. The location of production is being chosen increasingly outside the country of origin. The company, in fact, decides to produce abroad in order to cut the costs of production and to provide to consumers a cheaper product. The advent of ICT revolution has made it possible to split the tasks

[45] R. Vernon, "International Investment and International Trade in the Product Cycle".
[46] J. Ali-Yrkkö et al. "Who Captures Value in Global Supply Chains? Case Nokia N95 Smartphone", Journal of Industry Competition and Trade, 2011, 11(3): p. 263-278.

in many parts and to relocate the labor-intensive ones in countries that have a competitive advantage for that task.

For many years the theory of Vernon has proved true, developing countries have been seen more as recipient of technologies coming from the developed world rather than crucial agents in the development of new products. The majority of patents, which are the representation of innovation and which are usually attributed after years of research and development, have been issued mostly to developed countries. Nevertheless, this situation has seen some changes in recent times. First, many new patents are issued in developing countries, with China ranking number one for what concerns patents issued in 2019[47]. Second, due to the large markets that developing countries such as China and India represent, some firms are deciding to locate these R&D activities directly in the developing countries' market rather than relocate merely production. In this way, they aim to better understand the necessities that consumers in those countries have, and to exploit their preferences to gain the market share. The trend of R&D is thus changing, with companies that decide to innovate directly for the developing countries rather than delivering innovations discovered in their home country.

2.2 Reverse Innovation

The development of countries such as China and India has clearly brought drastic changes to the world of innovation. Nowadays, in fact, companies such as automobile and electronics are building new R&D centers in emerging economies[48]. New products are coming out from these centers which can have the possibility of not only

[47] WIPO, "China Becomes Top Filer of International Patents in 2019 Amid Robust Growth for WIPO's IP Services, Treaties and Finances", World Intellectual Property Organization, April 7, 2020, Accessed November 10, 2020, https://www.wipo.int/pressroom/en/articles/2020/article_0005.html

[48] D. Archibugi and A. Filippetti "Editors' Introduction: Science, Technology, and Innovation Go Global", in The Handbook of Global Science, Technology, and Innovation, ed. D. Archibugi and A. Filippetti, (Oxford: John Wiley & Sons Ltd. 2015), 1-11.

conquering the local market, but to disrupt western competitors as well[49]. Here comes the concept of Reverse Innovation.

This idea came to existence few years ago, coined by Govindarajan, Trimble and Immelt. Briefly speaking, it is considered as an innovation firstly used in a developing country and then spread to the industrialized world.

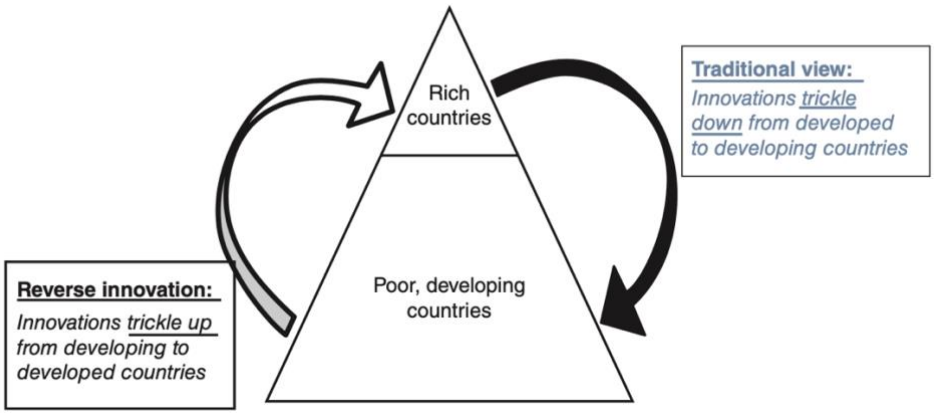

Figure 3: ***Reverse Innovation. "Govindarajan and Ramamurti, "Reverse Innovation, Emerging Markets, and Global Strategy".***

Reverse Innovation involves companies to innovate according to the needs of emerging economies for then reselling these products in industrialized economies in subsequent stages. It can be considered as the reversal of Vernon's Product's Life Cycle.

2.1.1 Definition of the Concept

Reverse innovation is a recent concept coined by Govindarajan, Trimble and General Electric's Immelt[50]. According to their view, it is a process that sees the introduction of a new product in an emerging market for then spreading in subsequent stages in the developed world. What has happened until few years ago according to Immelt et al.,

[49] S. Corsi and A. Di Minnin, "Disruptive Innovation . . . in Reverse: Adding a Geographical Dimension to Disruptive Innovation Theory", Creativity and Innovation Management, 2014: 76-90.
[50] J. Immelt et al., "How GE is Disrupting itself", Harvard Business Review, October, 2009.

is that developed countries' MNCs have pursued glocalization, the process through which innovations used to develop in the industrialized world and subsequently were transferred to developing countries as such, or with minimum modifications. Nevertheless, nowadays we have arrived at a moment where glocalization and reverse innovation must live together[51]. The scholars who have introduced this theory provide two assumptions that make this possible: 1) developing countries will soon catch-up with western countries, with the population willing to adopt innovations delivering high performance at minimum costs; 2) products for developing countries can create new markets in the developed world by providing good-enough goods at low prices, or will meet the needs of consumers disregarded by western MNCs[52]. However, in order to exploit the opportunity of Reverse Innovation there are some modifications to the business structure that historically powerful MNCs need to do. These are, according to the authors: "1) shift the power to where the growth is; 2) building new offerings from the ground up; 3) build local growth team from the ground like new companies; 4) customize objectives, targets, and metrics; 5) have the local growth team report to someone high in the organization"[53].

From this starting point, a number of scholars have tried to give their contribute and their view on this phenomenon. Radojevic, for instance, provided a reconceptualization of the term. According to the scholar, Reverse Innovation happens when an enterprise switches its primary innovation effort directly into a different country from that of origin[54]. Another slightly different view is provided by Esko, Zeromskis and Hsuan. This group of scholars, in fact, underlines the idea of adaptation. They consider Reverse Innovation when one product is first, created for and in

[51] J. Immelt et al., "How GE is Disrupting itself"
[52] Ibid.
[53] Ibid: p. 9-10.
[54] N. Radojevic, "Reverse Innovation Reconceptualised: Much Geo-Economic Ado about Primary Market Shift" Management International, 2015, 19(4), p. 70-82.

developing countries, then it is adapted to industrialized economies of the West[55]. Zeschky et al. contribution, was based on an analysis of different case studies present in the literature. They divided these cases into different types of innovations: Cost Innovation, Good-enough Innovation, and Frugal Innovation. According to the scholars, each of these innovations has a different likelihood of being marketed in the West, completing the process of Reverse Innovation. The likelihood depends on the characteristics of the innovation introduced into the emerging market. For instance, for what concerns cost and good-enough innovations, they are easier to introduce in the Western markets compared to frugal innovations. The latter, usually involve new product introductions closely tailored to the needs of the emerging market which may hamper the success in case of marketization in the West.[56] Finally, Cramer outlines the importance of Reverse Innovation in satisfying local consumer's needs. It is a sort of antidote against the classic flow of innovations which involved the creation of new products always tailored for industrialized countries but never according to emerging markets' requests[57].

Nevertheless, one of the most important contribution which has definitely expanded the concept of Reverse Innovation was brought ahead by Corsi et al. First of all, in their research, the scholars advance the idea that a change in R&D and innovation is happening worldwide, they argue that first, emerging countries such as China have become a primary target for MNCs, leading them not only to locate R&D in these areas but to develop a peculiar product which meets local needs, their aim is to launch the product directly in this market. Second, product development and R&D is increasingly conducted in these countries to understand local characteristics and provide innovations that fit in these markets. Third, products of this kind might prove superior to products in developed countries and might be introduced in these markets. Fourth,

[55] S. Esko, M. Zeromskis and J. Hsuan, "Value chain and innovation at the base of the pyramid", South Asian Journal of Global Business Research, 2013, 2(2), p. 230-250.
[56] M Zeschky, S. Winterhalter and O. Gassmann, "From Cost to Frugal and Reverse Innovation: Mapping the Field and Implications for Global Competitiveness", Research-Technology Management, 2015, 57(4), p. 20-27.
[57] Cramer, Y. Reverse Innovation a Poplular Trend; Blogging Innovation, 2010: https://bradenkelley.com/2010/02/reverse-innovation-popular-trend.html

firms or branches in these developing countries not only develop but "conceive product ideas based on their own technologies and scientific insights."[58].

According to them, Reverse Innovation entails any type of innovation that, at some stage during the process, has a reversal of the flow of innovation from developing to developed countries. In fact, the scholars have added a linear innovation model with 4 different steps: conceptualization, product development, primary market, and secondary market. Through this introduction, they have expanded the definition of Reverse Innovation beyond its market-introduction focus[59]. In particular, they categorize the innovations into three different macro areas: Reverse innovation in the strong sense; Reverse innovation in the weak sense; and Traditional global innovation flows. In the picture provided below, retrieved directly from the paper published by the scholars, we can see that the darkest color represents strong Reverse Innovations, the lighter one represents weak Reverse Innovations, while the remaining ones are Traditional innovation flows.

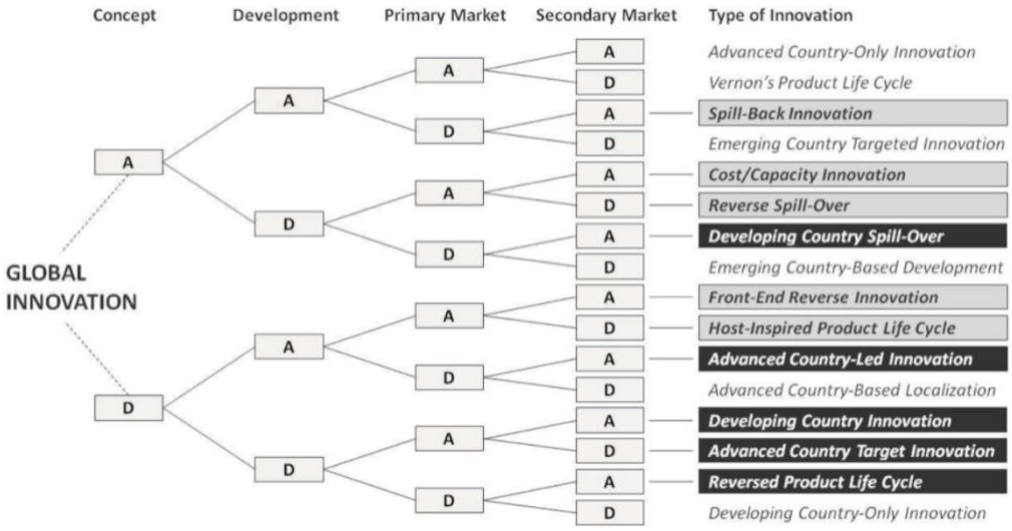

Figure 4: Reverse Innovation linear framework[60], S. Corsi et al., "A Typology of Reverse Innovation".

[58] S. Corsi et al., "A Typology of Reverse Innovation".
[59] Ibid.
[60] Ibid.

From all the various conceptualization and advancement to the idea of Reverse Innovation, the main contribution and the reference point of this concept has been undoubtedly provided by Govindarajan, Trible and Immelt. Nevertheless, the topic has been covered extensively by other scholars, and some of them have made important advancements. Especially, the linear model provided by Corsi et al. is important for giving a better definition to the different types of innovations introduced first into emerging economies and then transferred in the West. For this reason, in this research will be used that framework to categorize the case studies under scrutiny into different types of Reverse Innovation. In this way, the researcher can compare the different types of Reverse Innovation taking place in the Asian Country and classify them as Strong Reverse Innovation, Weak Reverse Innovation, or Traditional innovations.

2.2.2 Why Reverse Innovation?

In general, the creators of the concept of Reverse Innovation, argue that, nowadays, developing countries are not just borrowing technologies, they are active participants in the development of new ideas and products. More importantly, there are examples of these products developed for emerging markets that, due to their high-performance low-cost peculiarity, not only become popular in the country of origin, but start to spread in other emerging markets and in developed countries as well, disrupting the historical MNCs present in the territory[61]. However, the spread of this phenomenon is still at the initial stages. Some of the examples, apart from the ones which will be described later on, are: General Electric's portable ultrasound machines which have developed in China and then were transferred to developed countries' markets[62], natural ingredients which were used in India and then were approved as medicines in the United States and Europe, and the phone developed by Nokia in its R&D center in

[61] C. Hang, J. Chen and A. M. Subramian, "Developing Disruptive Products for Emerging Economies: Lessons from Asian Cases", Research- Technology Management, 2010, vol. 53(4), p. 21-26.
[62] V. Govindarajan and C. Trimble, "Reverse innovation: Create far from home, win everywhere."

Beijing, which first targeted the Chinese market and was then introduced in Europe[63]. These have proved to be all successful strategies for the companies involved.

The concept of Reverse Innovation is extremely important and needs to be taken carefully into account by multinational corporations operating in emerging economies. Nowadays, as innovation scholars argue, it is time for firms to get more interested in providing these types of innovations due to the astonishing rates of growth of demand for innovative products in emerging markets. People from the middle-class in these areas represent an extremely attractive share of possible consumers for companies both local and foreign multinationals. As a matter of facts, local companies are developing fast and are trying to meet the needs of these people. Differently, their foreign counterparts risk to still be attached to the old system of delivering innovations that have already been introduced to their own industrialized markets. This is what Corsi et al. call Traditional global flow innovations[64] and what has been described by Vernon as the Product's life cycle[65]. Govindarajan and Ramamurti push the idea that if Western MNCs do not start innovating for that typology of customers, they incur in the risk of being ruled out of the market before even starting to compete[66]. Yet, there are a bunch of them that are trying to develop innovations peculiar to the conditions of emerging economies, or even trying to provide innovative products which then decide to transfer globally. Those which were successful, have seen an important growth in developing countries' sales.

2.2.3 How to develop a Reverse Innovation?

In order to understand this new wave initiated by Govindarajan, Trimble and Immelt, it is important to draw a clear dividing line between Reverse Innovation and classic

[63] S. Corsi et al., "A Typology of Reverse Innovation".
[64] Ibid.
[65] R. Vernon, "International Investment and International Trade in the Product Cycle"
[66] V. Govindarajan and R. Ramamurti, "Reverse Innovation, Emerging Markets, and Global Strategy" Global Strategy Journal, 2011, Vol. 1, p. 191-205.

innovation from the West. Reverse Innovation, in fact, is considered to: "involve novel and innovative combinations of existing knowledge and technologies to solve pressing local problems and the use of new processes and business models[67]" The typology of innovations that emerge from this process are likely to be dramatically improved for what concerns price-performance. The innovation should be in line with the local needs, for example, it needs to be easy to use if consumers are relatively unsophisticated compared to Western criteria. Affordability can be considered as an important feature; however, it is not the most important one, rather, "it is about creating fundamentally different products to meet the needs of people in these markets.[68]"

Functionality of reverse innovations might be reduced, nevertheless, the importance is that products maintain an acceptable quality for the customers. A powerful statement made by Govindarajan in his book which explains perfectly the difference between emerging economies' consumers and industrialized economies' ones says that "one person with ten dollars to spend has a vastly different set of wants and needs than ten people each with one dollar to spend."[69]

According to Reverse Innovation theorists, it is widely shared that Research and Development is of extreme importance in these cases, the department should be working for tackling the needs of the population, understanding the problems that they are facing, and provide new innovations accordingly. The placement of marketing organizations can as well help this process since it gives the opportunity to acquire the necessary knowledge for understanding what consumers want. Thus, one of the main concerns for an enterprise operating in emerging economies should be to live in the country to understand the voices of possible consumers and provide a product that meets their necessities. Important to notice is that these solutions are likely to change

[67] Ibid. p.193.
[68] V. Govindarajan and J. Euchner, "Reverse Innovation", Research-Technology Management, 2012, 55(6), p. 13-17: 13.
[69] V. Govindarajan and C. Trimble, "Reverse innovation: Create far from home, win everywhere."

industries in rich countries because, innovations in emerging markets, "create solutions that are affordable and of good quality" [70], characteristics that will undoubtedly be welcomed by industrialized world's consumers as well.

Govindarajan and Trimble suggest that, in order to thrive, there is the need of changing the traditional organization framework and give more power to the local branch. This idea is clearly represented by their extremely meaningful and impactful phrase: "reverse innovation begins not with inventing, but with forgetting"[71]. Entrepreneurs coming in emerging economies should leave behind all the logic that has helped them to be successful in developed countries. They have to start from zero and adopt completely different approach in order to meet the needs of completely different people. Adopting technologies that were successful in the West will not get you anywhere in this "new world". You have to create ad hoc products for meeting the needs of these local costumers if you want to succeed.

[70] V. Govindarajan and J. Euchner, "Reverse Innovation".
[71] V. Govindarajan and C. Trimble, "Reverse innovation: a global growth strategy that could pre-empt disruption at home", Strategy and Leadership, 2012, 40(5), p.5-11: p.6.

3. Reverse Innovation in China

3.1 Responses to Reverse Innovation concept

Govindarajan and Ramamurti wrote in 2011 "we believe more research and case studies are needed to establish the true extent of Reverse Innovation and its future potential"[72]. This question of the authors to provide more empirical examples to contribute to the literature has been welcomed by different scholars. There are some case studies that have successfully represented Reverse Innovation. A considerable amount of them have concentrated on China. The Asian country, in fact, represents the perfect example of a growing middle-class willing to adopt breakthrough innovations that are affordable, but at the same time of good quality. These cases show how companies behave in order to provide these kinds of products to Chinese consumers. They show how MNCs adapted to the local needs of the population, how they changed their organization by directing Research and Development to discover new functionalities that might have been happily welcomed by the population.

3.2 Western MNCs and Reverse Innovation

China has been one of the perfect examples of countries in which multinational corporations have decided to innovate and have paved the way for Reverse Innovations to take place. Together with India, these two countries represent an astonishing number of opportunities for Western MNCs[73]. Some case studies, in fact, have been conducted on different actors present in China which show the potential of the Asian country in being a source of innovation rather than a simple recipient of innovations coming from the West.

[72] V. Govindarajan and R. Ramamurti, "Reverse Innovation, Emerging Markets, and Global Strategy", p. 193.
[73] V. Govindarajan and C. Trimble, "Reverse innovation: Create far from home, win everywhere."

3.2.1 General Electric

As the example provided by father of the term Govindarajan demonstrated, companies such as General Electrics have already developed their Reverse Innovations. One clear example provided by the author is the compact portable ultrasound for the Chinese market. The American company, which had always provided healthcare machineries for the industrialized countries, was struggling in the PRC's market. Thus, instead of continuing producing its high-end goods, which could have met just the high-end and richest 10% of market share of the Chinese population, decided to produce something that could meet the necessities of the majority of the people. They developed this particular product sold for $15,000 in 2007, much less than the original product they used to produce. The performance was not as the high-end products provided by the company, nevertheless, it had all the necessary features and, more importantly, this product was much more affordable by the whole population. As a consequence, it proliferated in the rural clinics of China. "Today the portable machine is the growth engine of GE's ultrasound business in China." [74] General Electric was able to understand the necessities of the majority of the population in China, rather than continuing to provide goods only to the richest sector of Chinese people.

This product, in consequence, not only proved to be widely requested in the Asian country, but it also completed the reverse innovation process by becoming popular in the West as well. In fact, the innovation saw astonishing rates of sale in the industrialized world, it was used "where portability is critical or space is constrained, such as at accident sites, where the compacts are used to diagnose problems like pericardial effusions (fluid around the heart); in emergency rooms, where they are employed to identify conditions such as ectopic pregnancies; and in operating rooms, where they aid anesthesiologists in placing needles and catheters."[75] After all, it can be said that General Electrics benefited largely from this reverse innovation.

[74] J. Immelt et al., "How GE is Disrupting itself", p.9.
[75] Ibid. p.10

3.2.2 Esaote, Magneti Marelli, Brembo and Carel Industries

Simone Corsi et al. have provided 4 case studies of Italian companies in China adapting their Innovations for the Chinese market. These are Esaote, Magneti Marelli, Brembo, and Carel Industries. The authors identify three primary reasons that have contributed to the success of local R&D centers in providing new innovations: "State Intervention, local competition and local market features"[76]. Chinese government intervention can give indications for foreign R&D centers on identifying new possible successful products. An example is the development of brakes by Brembo. The company, due to the growing importance of sustainability in the eyes of Chinese policymakers, has adapted by producing systems that would have reduced emissions through, for example, the lowering of the weight of these products by 10%, together with other features. Local competition, the second feature, is based predominantly on low-cost: providing products of a slightly lower quality but of extremely lower prices as well. Foreign Multinationals in China have to provide cheap products in order to compete, these products might then be transferred to advanced countries in lower segments disregarded by MNCs. Finally, local markets features are the last key factor. You have to adapt to what are the local needs. This is represented by the case of Carel: the company, to be successful, had to provide first of all a 25% cheaper product, in addition, they offered a more user-friendly interface that would have met the relatively less sophisticated Chinese consumers[77]. In general, they adapted to the local conditions in order to be able to sell to the local population. In the end, the companies under scrutiny, after having supplied products that were meeting needs of the Chinese population, had products that could have been easily marketable also in advanced countries, especially to those sectors which are price sensitive.

[76] S. Corsi et al., "New Product Development in Emerging Economies: Innovation in Reverse from China" in The Handbook of Global Science, Technology, and Innovation, ed. D. Archibugi and A. Filippetti, (Oxford: John Wiley & Sons Ltd. 2015), p. 222-244.
[77] Ibid.

3.2.3 Speres

Corsi, Di Minnin and Piccaluga provided another interesting case study concerning the Italian company Speres, a mid-sized company which manufactures air-conditioning, commercial refrigeration, and humidification systems. It started its operation in China in 1997. The company took the decision of establishing a production plant in the territory together with a R&D center. First, Speres' R&D aim was to adapt European products to the Chinese market. However, since the company was not being successful, Speres China's general manager conducted an analysis of Chinese competitors. He discovered that Chinese companies were providing products of high customization but low technical standards. The complex solutions of Speres were not necessary for Chinese local needs. Thus, he advised two important attributes (simplicity and cost reduction) that should have been implemented for the Chinese market. Technical specifications of the Chinese subsidiary were sent to Italy in order to provide something which would have been better accepted by local costumers. The result was that the product was actually successful in Europe, nevertheless, it faced strong internal resistance justified by the risk of incurring in cannibalization of other products. If fact, commercialization in Europe was initially limited. Subsequently, however, the company decided to provide European markets with this product, by proposing it to those consumers that could have not afforded the premium European technology. This product was able to penetrate market segments in which Speres was not present, such as residential market.

The authors highlight that, in this case, Speres followed three steps in its Reverse Innovation process: "problem identification, analysis of local competitor products, and transmission of product attributes to the headquarters development team". Moreover, they considered three characteristics to have been crucial for achieving reverse innovation: the importance of a local champion, as was the case of the local general manager who triggered the development process; recognizing the possibility of innovation from emerging markets, creating a product that would respond to Chinese

demands; and finally, the need of a global team, as the interconnection between the Chinese team and the Italian developers has showed. This case is a clear representation of how crucial the Chinese market can be in achieving innovations that could easily enter industrialized markets such as the European one[78].

3.2.4 Siemens SMART Initiative

Another case study is the German multinational Siemens. The company decided to provide some products peculiar to emerging countries' markets. In order to compete, they implemented the SMART initiative: providing products which are Simple, Maintenance-friendly, Affordable, Reliable and Timely-to-market. This was done to capture the medium and low-end of the market which represents the largest portion of the population of emerging economies such as China. These costumers have the characteristic of being extremely price-sensitive, they need simple and easy-to-use products, do not care about brands, and need a maintenance free solution. Siemens, in addition, provided new features and functionalities able to meet the local needs of these regions. SMART products usually followed three phases: needs identification; cost-minimization, assembly of components.

The innovations of Siemens resulted to be of low cost, without affecting the overall quality. Localization is another important feature: in order to get all the know-how of local markets, face to face interaction is needed. Thus, the whole process of developing new innovations should be close to these areas. In addition, as the developed world is becoming more price-sensitive, these innovations have the possibility to be transferred back to the home countries of these multinationals, targeting medium and low-end consumers of developed nations. Siemens was able to achieve Reverse Innovation, especially for what concerns healthcare products (Magneto Resonance and Computed Tomography) which were first adopted in 2nd tier cities' hospitals in China and then

[78] S. Corsi, A. Di Minnin and A. Piccaluga, "Reverse Innovation at Speres: A Case Study in China".

used as backup in United States healthcare. This case is another representation in which a Western multinational, by adapting to local needs, was able to provide low-cost and good-quality products that found a positive demand also in the home market[79].

3.2.5 Danish MNC

The same scholar, Agarwal, together with other two academics, have described a case of a Danish Multinational Corporation as well. Through the means of a case-study analysis and semi-structured interviews with relevant employees of the company, the author has carefully described the process and the reasons that have led this company to successfully improve its market position through Reverse Innovation. The MNC had set up a local R&D department in China. This, according to the author, was crucial for exploiting fully the potential of the local team and so to provide a specific product for those market needs. Another essential contribute was given by the constant cooperative behavior taken by the headquarter towards the Chinese team, as well as the closeness to the local Emerging Market. Finally, the senior management willingness of bringing this product in the Western markets was crucial for contributing for the success of the company. The case described is a clear representation of Reverse Innovation and shows its undeniable benefits for the company as a whole.[80]

3.2.6 Philips

Another study was conducted by Shan and Ali Khan, they analyzed the phenomenon of Reverse Innovation for three products of the company Philips, all of these were initially directed to the Chinese market.

[79] N. Agarwal and A. Brem, "Frugal and Reverse Innovation - Literature Overview and Case Study Insights from a German MNC in India and China", 2012 18th International ICE Conference on Engineering, Technology and Innovation, Munich, 2012, p. 1-11.
[80] N. Agarwal, A. Brem and S. Dwivedi, "Frugal and Reverse Innovation for Harnessing the Business Potential of Emerging Markets – The case of a Danish MNC", International Journal of Innovation Management, 2020, 24(1), p. 1-15.

In the first case, the product provided by the company was the GoPure automotive air purifier. Since pollution is a big problem for China, the company was able to understand the necessity of the local population and provide a product that would meet their needs. The development of the product was done by the R&D center in Shanghai. The product offered an efficient solution which was eliminating the 99.9% of harmful substances in the air. The price, however, was relatively affordable by the Chinese middle-class (400 RMB). It was confirmed by Shen, the Automotive Air Purifier Product Marketing Manager for Philips China that there was a positive orientation of the top management of Philips in regard to this local innovation. The study adds that, subsequently, GoPure has been successfully exported to Americans and European markets.

The second case involves the Noodle Maker. The idea came out directly from the Kitchen Appliances Innovation & Development Team (KAIND) Center in Shanghai. The rationale behind this innovation was to help Chinese people in keeping their tradition of noodle making. The machine would have facilitated the population to keep making their own noodles at home. Moreover, being health-related concerns increasingly important in China, especially when speaking about food, this product would have ensured the food safety and control over ingredients. The result was that, initially, 40,000 of these machines were sold to the Chinese market, while subsequently, 200,000 were sold to other parts of the world, with North America being the largest buyer.

The last case described by the paper regards the Philips Ultrasound Machine ElastPQ. Hepatitis B Virus is quite common in China, approximately 7.18% of the population according to the author. This, can turn into chronic hepatitis B and eventually might result in cirrhosis, causing liver cancer. At the time, in order to discover a liver cancer, the only solution was biopsy, which, apart from being painful, was too expensive for Chinese middle-class. Thus, the R&D center in Shanghai developed this new

innovative product. This fits perfectly for the Chinese community since it is able to discover whether there is any abnormality with the liver. However, differently from biopsy, it is simple, accurate, non-invasive, cheap and painless. This has led many Western Chinese hospital to increasingly use this product. As a matter of facts, EU governments are now recommending the same kind of technology to diagnose liver diseases[81].

3.2.7 Harman International

Finally, the case of the automobile-infotainment division of Harman International described by Govindarajan in the Harvard Business Review is another episode which shows the potential of emerging markets in triggering innovation. The company was able to provide a simpler and cheaper product for the emerging market which was subsequently adopted in the West. The company's product development had changed radically for this purpose. They established R&D centers both in China, for hardware development, and in India, for software development. The whole initiative was named Saras, which means "adaptable" in Sanskrit. They had provided flexibility and empowerment to the local team and had set goals to produce an innovation which resembled the characteristics of the Western products, but at much more affordable prices. The whole initiative, despite in the beginning found some resistance due to the considerations of low-quality products that were attributed to these emerging countries' innovations, overcame these problems and proved to be an extreme success for the company. In fact, "the sales staff recognized that lower prices didn't necessarily mean smaller commissions. With a higher net profit per unit and a much larger volume base, sales commissions stood to rise, too."[82] 18 months after launch, Saras had a turnover of 3$ billion.

[81] J. Shan and M.A. Khan, "Implications of Reverse Innovation for Socio-Economic Sustainability: A Case Study of Philips China", Sustainability, 2016, 8, 530.
[82] V. Govindarajan, "A Reverse-Innovation Playbook", Harvard Business Review, 2012, April. P. 6.

3.2.8 Summary of case studies

While the cases described by Corsi et al. provides a description of how Italian companies are adapting their R&D activities to Chinese characteristics, all the other case studies mentioned above represent successful cases of Reverse Innovation. All of the cases described have seen the development of peculiar products for the Chinese market. While in the past, the traditional flow of innovations started from industrialized economies and ended up in emerging economies, the cases described above represent the reversal of this trend. New products are first introduced in emerging economies, not only by local MNCs but also by Western MNCs. These products, subsequently, are offered as such to Western markets, sometimes achieving high rates of sales.

The success of these MNCs represents the numerous opportunities that reside in the Chinese market. The concept of Reverse Innovation, as previously mentioned, can be considered as beneficial in two aspects for enterprises. First, by delivering products for emerging countries' middle class, there is the possibility of boosting considerably the amounts of sales in those countries. The middle-class is growing fast and represents a huge number of people, willing to adopt new innovative products. Second, the same innovation could be easily marketed in the West, without modification. It could create a market where there is not, or it could target the low-end market of industrialized countries which, due to low revenues, might be disregarded by MNCs present in the territory.

3.3 Common conclusion of past research

Reverse Innovation theory is the base of this research. Some specifications about how to achieve Reverse Innovation are present in the literature. General guidelines have been provided by Govindarajan, Trimble and Immelt, and an enlargement of the concept has been advanced by Corsi et al. Moreover, a powerful enrichment has been

provided by the case-studies conducted by scholars who have analyzed the behavior of firms in relation to Reverse Innovation. By analyzing these case studies, it is understandable that most successful companies have been those which have decided to develop new products for the peculiar needs of emerging economies, especially China. Differently from the past, companies from the West are now deciding to innovate for countries like China, rather than simply trying to sell innovations already introduced in Western markets. If you want to achieve high rates of sales in those countries, you have to provide products that meet the needs of those countries. It has been proven from the cases above that, when Western MNCs have modelled their innovations accordingly, they have been able to sell successfully both locally and in their home market. With the presence of an R&D center inside China, Western MNCs have successfully innovated according to local needs, creating a product sellable in industrialized economies as well, whether creating new markets, or whether tackling the needs of the low-market segment.

3.4 The Gap in the Research

Given the importance and popularity that Reverse Innovation is gaining nowadays, especially due to the fast development of emerging economies such as China and India, it is important to analyze and understand whether it is possible for Italian companies to exploit fully the potential of innovating for these emerging markets. Italian companies have always been popular worldwide for their high-quality manufacturing of products, especially those part of the mechanical industry. These types of products are usually easily accessible by the middle-class, are characterized by high volumes of sales, and need constant technological improvements in order to win the competition against numerous competitors. In the course of history, many Italian companies have thrived thanks to their know-how. However, nowadays, an important source of revenue comes from emerging markets. Italian companies, according to Reverse Innovation theory, should be innovating for these emerging markets, providing new solutions to

local problems, without simply delivering innovations already successful in their country of origin.

The purpose of this research, thus, reconnects with the importance of Reverse Innovation theory, and tries to apply this new paradigm of Innovation to one of the most successful sectors of Italy, the mechanical industry. By understanding the feasibility of this phenomenon in these types of Italian companies, this research brings an important contribute to Innovation studies. In fact, it first of all, understands whether Reverse Innovation theory is applicable to Italian companies part of the mechanical sector. Furthermore, another issue to take into consideration is that the business entities analyzed in this research present another important difference from past researches. Differently from the cases on Reverse Innovation conducted up to now, in fact, the enterprises analyzed have the characteristic of being much smaller in size. For instance, the majority of companies studied in light of the Reverse Innovation paradigm are extremely large MNCs such as PepsiCo, Procter and Gamble, General Electric, Siemens, Philips, Harman International and so on. If we look at the number of employees or the international presence of these companies compared to the ones under scrutiny in this research, there is an undeniable difference in size. Thus, while the applicability of Reverse Innovation has been proved and defined as successful for what concerns these international giants, in respect to large enterprises of smaller size, the topic has not yet been investigated widely.

By studying the behavior of this category of companies, this research might prove or disprove the possibility of pursuing Reverse Innovation for these smaller companies as well. This means that this study could be provided as a good indication for those mid/large companies already present in China which are struggling to gain the market share, and which are not creating peculiar products for these emerging markets.

In order to provide a definition of the different products encountered during this research, it has been used the linear innovation framework developed by Corsi et al. which is considered as an enlargement of the concept of introduced by Govindarajan.

4. Reverse Innovation in the Italian Mechanical Sector

4.1Presentation of the companies and their Chinese presence

4.1.1 Vortice Elettrosociali S.p.A.

The first company that has been analyzed and has as well welcomed the request of the researcher and accepted the invitation for an interview is Vortice Elettrosociali S.p.A. The Italian multinational has established since 2013 a Research and Development Center in the city of Changzhou. Vortice Elettrosociali S.p.A. is an Italian multinational corporation which is specialized in the production of technological air solutions. According to the company profile, they provide different solutions for its customers: "efficient air solutions; central air exchange system with heat recovery; air-conditioning in domestic environments; ventilation in hospitals and/or industrial environments; destratification of warehouses and/or shopping centers."[83]

Vortice came to existence in 1954, and it has always been concerned with innovation, design and research. Nowadays, it is considered as a reference for what concerns residential ventilation in Italy and abroad. In total, the Italian enterprise has 5 branches spread all over the world. The headquarter which resides in Tribiano (Milan), a branch in Verona, a branch in the UK (Vortice UK Ltd.), a branch in San josè, Costa Rica (Vortice Latam) and finally, the one which will be taken under scrutiny for the purpose of the paper, the Chinese branch in Changzhou, established in 2012. According to the retrievable information, the Chinese branch is involved in the development, production and commercialization of specific products for the Chinese market. The official name of the Chinese department is Vortice Ventilation System (Changzhou) CO., Ltd. The

[83] Vortice S.p.A.,"Vortice Company Profile", accessed March 6, 2021 https://www.vortice.com/en/

database Orbis of Bureau Van Dijk has recorded that the Italian company Vortice had a Turnover in 2019 of around 50 Million $[84].

The former president of Vortice was interviewed by Italian journals when he decided to open the new branch of Vortice in the Asian Country. Carlo Pagani, who was the one who took the decision to go for the Foreign Direct Investment and establish the plant in Changzhou, said that it was the first time that Vortice opened a branch so far from the domestic market. According to him, China is a crucial market for the company, a market in which the company is confidently betting. Apart from a productive site, he continued, a research and development center has been established to meet the needs of the Chinese market[85]. The Chinese productive site, initially, produced ventilators and air conditioners which are less technologically advanced than their Italian counterparts. These, despite not feasible to being commercialized in the European countries, were thought to have a great potential in emerging economies such as China and countries in South East Asia. Furthermore, the establishment of a research and development center would have helped the company to provide products that fit with the local tastes and needs. To give an idea of the prestige that the company has in China, at the Chinese website, it can be retrieved information on the various important projects that have seen Vortice S.p.A. as a main actor in the Chinese territory. In fact, it is published a brief list of all the important buildings in the Asian Country which have decided to adopt the innovative solutions of the Italian company for the ventilation system. Some of them are Chongqing-Nanbin One, Beijing Capital Airport, Beijing World Trade Center Tower and Xiamen-Haixi Center[86]. In order to gather more information for this dissertation, the researcher had the possibility of interviewing the Technical and Operations Director of Vortice Ventilation System

[84] Bureau Van Dijk, 2019, latest operating revenues of Vortice Elettrosociali S.p.A. https://orbis.bvdinfo.com/
[85] Ansa Regional Services, "Industria: Vortice Inaugura Fabbrica in Cina", April, 11, 2013, accessed February 8, 2021, https://global.factiva.com/ha/default.aspx#./!?&_suid=161606780871705709531072341525
[86] Vortice S.p.A., "Cases in China", Vortice Group, accessed Febryart 9, 2021, http://en.vortice-china.com/Case/index/flag/1.html

Changzhou. He has been living in China for 9 years and has been involved in the Changzhou's branch of Vortice since its establishment in 2013.

4.1.2 Emak S.p.A.

The second company analyzed and welcoming the request for interview was Emak S.p.A.. Emak is an Italian multinational corporation, it was founded in the early 1970s in Reggio Emilia and it is specialized in the production of three different typology of products: "Outdoor Power Equipment: manufacturing and distributing machines for gardening, forestry applications and agriculture; High Pressure Water Jetting: specializing in pumps for agriculture and industry, high pressure washers and urban cleaning; Components and Accessories: developing products for all of the sectors mentioned above, from brushcutter heads to sensors and computers (for precision farming)."[87] The company is considered to be one of the key actors for what concerns innovative solutions related to gardening, agriculture and forestry equipment. It is listed in the Star segment of the Italian stock market and has had a turnover of $452 million in 2018. Overall, Emak has 5 commercial branches around the world apart from Italy: one in Spain, one in the UK, one in France, one in China and one in Brazil.

Fausto Bellamico, the president and Chief Executive Officer of the company, is betting in the Chinese market. It was the 2004 when the company had established its first production site in Jiangmen City. This site, situated in the Guangdong province, is involved in the production of equipment "hand-held" with the objective of penetrating the price sensitive market segments. Furthermore, the company has expanded in the Asian Country in 2008 through the acquisition of a Chinese company called Tailong Machinery Manufacturing Equipment L.t.d., in Zuhai, which was specialized in the production of cylinders for two-stroke engine. Through this acquisition, Emak has gained control of a rare technology in the market due to the low number of suppliers.

[87] Emak S.p.A.,"Area of Business" Emak Group, accessed March 9, 2021, https://www.emakgroup.com/int/emak-group/

This made it possible the vertical integration of production, leading to economic advantages and at the same time making it possible to keep a high quality of products with the increase in flexibility that this operation will bring. In fact, this makes it possible to create and exploit organizational synergies for what concerns research and development, quality, and supply chain.[88]

This intense development in the Chinese market has continued to increase. Nowadays, the number of employees of Emak S.p.A. in the Jiangmen branch is around 120. The former president of Emak Giacomo Ferretti, before passing away, argued that the strategy of Emak was to exploit the low labor cost present in China, and as well to penetrate the market of low-cost lawnmowers and chainsaws, without losing on the quality of products. The structure of the multinational company was as follows: in Bagnolo, the headquarter, the company would have invested on high-quality products; while at Jianmeng, the company would have adapted to the Chinese and emerging markets' characteristics with more affordable products. The Chinese branch would have functioned as a bridge to enter not only in China, but into the whole Far Eastern market, where the company was not yet present.[89] The person who has accepted the request for the interview is the Technical Director of Emak S.p.A. The interviewee is a high-ranked employee who manages every single product of the company, from the development to the introduction to the market.

4.1.3 Maschio Gaspardo S.p.A.

The third company analyzed and welcoming an interview has been Maschio Gaspardo S.p.A.. Maschio Gaspardo is an Italian company considered an international leader for what concerns the production of agricultural machineries. It has 8 different plants worldwide, five in Italy, one in Romania, one in India and one in China. It was founded

[88] Emak Press Release, acquisition of TAILONG (Zhuhai) Machinery Manufacturing Equipment L.t.d., July 2008. Accessed February 18, 2021. **http://www.euroborsa.it/pdf/em0115-15-2008.pdf**
[89] Milano Finanza, "Ferretti mette ordine in Cina" July 5, 2008. Accessed February 14, 2021. https://www.milanofinanza.it/news/ferretti-mette-ordine-in-cina-1558918?amp=False&archivio=True

in 1964 and has constantly grown since its start of operations. Specifically, "the Group produces a wide range of rotary tillers, power harrows, mulchers, precision planters, cereal seed drills, combination cultivator-drills, flail-mowers, ploughs, minimum tillage, spraying and hay making equipment"[90]. According to the company profile, Maschio Gaspardo had an operating revenue of $320 million in 2019. Of these numbers, around the 86% came from foreign markets' sales.

Initially, the company entered in China in 2005, through the opening of a production plant in Qingdao involved in the production of "small rotary tillers, mulcher and finishing mowers for the export market". [91] After this initial phase where the production plant was rented, the company has decided to go for the Foreign Direct Investment and open in loco a new plant, this time directly owned by the company. In 2014, everything was ready for starting a new chapter of Maschio Gaspardo's life in China. A much larger plant to satisfy a much larger request from the Chinese market[92]. The number of employees in this new plant has risen to around 180, and the number of machines produced, while in the former plant was 8.000, today, in this new plant, the number has doubled to 15.000[93].

The former president of the group Egidio Maschio, at the time of the opening, declared in an interview that the new plant in China was the representation of the willingness of the company to grow internationally, especially in those markets where, due to an increase in the population, there are important increases in demand for agricultural products, and consequently, an increase in the demand of agricultural machineries. The plant had been originally thought for primarily satisfy the local market's needs and, in

[90] Maschio Gaspardo, "The Group and its History", accessed February 21, 2021. https://www.maschio.com/menu-istituzionale-en-GB/the-company/the-group-and-its-history/
[91] Ibid.
[92] F. Fasulo, "Intervista a Alessio Riulini, General Manager di Maschio Gasbardo Agricultural Machinery Co. Ltd.", ISPI, May 25, 2015, accessed February 23, 2021: https://www.ispionline.it/it/focuscina/intervista-alessio-riulini-general-manager-di-maschio-gaspardo-agriculture-machinery-co-ltd-13389
[93] R. Cattivello, "Maschio Gaspardo raddoppia in Cina", il Friuli, November 4, 2014. Accesed February 22, 2021: https://www.ilfriuli.it/articolo/economia/maschio-gaspardo-raddoppia-in-cina/4/137447.

the future, to satisfy also other markets.[94] Alessio Riulini, the general manager of Maschio Gaspardo China, said that being present locally permits the company to grasp the opportunities of a market which is constantly growing and where the need of mechanization for agriculture is growing as well. In order to meet comprehensively the necessities of this growing market, within the new plant, a Research and Development center has been established. In this way, "we can satisfy the market's needs of such a complex market."[95]

The person that welcomed the interview in this case is the Sales Area Manager of the APAC region of Maschio Gaspardo S.p.A who resides in the city of Qingdao.

4.2 Analysis of the companies in light of Reverse Innovation

Among these companies, two out of three have decided to establish a research and development center directly inside the Chinese territory, Vortice and Maschio Gaspardo. Nevertheless, each of the companies under scrutiny have an important common characteristic. Vortice and Maschio Gaspardo, with their foreign Research and Development center, are developing new products where the primary market of entry is China. Differently, Emak despite not having an R&D center in China, it is still creating peculiar machines for the Far East, among which, China is the largest country. Therefore, each of these companies is providing peculiar products to the Chinese market rather than just introducing products that were already successful in the West. In this section will be analyzed those products which were tailored for Chinese needs. It is understandable whether they have been reproposed, subsequently, in industrialized economies, completing the process of Reverse Innovation, namely, trickling up from developing to advanced countries.

[94] E. Gaspardo, retrievable at AgricolturaNews.it, "Un nuovo stabilimento in Cina per Maschio", November 4, 2014. Accessed March 1, 2021: https://www.agricolturanews.it/un-nuovo-stabilimento-in-cina-per-maschio/
[95] R. Panci, "La nuova Via della Seta, la Cina tra rischi e opportunità", Edagricole, April 30, 2019, accessed March 1, 2021: https://macchinemotoriagricoli.edagricole.it/economia-e-mercati/la-cina-tra-rischi-e-opportunita/.

4.2.1 Case 1: Vortice

For what concerns Vortice, the innovations for the Chinese market, developed directly in loco, are different compared to those marketed in the West. The Italian multinational specialized in ventilation systems uses the local R&D to create new innovations in line with Chinese consumers' needs, which of course, have different tastes compared to western consumers. As outlined by the interviewee, differently from some years ago, where the focus was more on the import of technologies and products from Italy, nowadays, the trend has changed. Vortice now develops in China, produces in China, with the objective of selling first in China these products. Of these products, three main new introductions by Vortice have been analyzed.

First, in China Vortice has introduced ventilation systems with much higher filtration capacity (HEPA Filters). This peculiarity was implemented exactly for the characteristics of Chinese environment. In fact, the Celestial Empire, despite in recent years the situation has improved, still has level of pollution which are far higher than the West. Thus, delivering products without this characteristic might have led the company to not penetrate successfully the Chinese ventilation market. By understanding this peculiar need of the local population, the company has introduced an ad hoc innovation that is not present in its European catalogues. A similar innovation was implemented by Philips, the GoPure air purifier for auto vehicles which had success in China and was then introduced in industrialized countries' markets[96].

Second, another example of an innovation primarily delivered to the Chinese market and created inside the local R&D in China is the ventilation system with integrated dehumidification. Being China an extremely large country, there are areas, like the South Eastern part of China, where there is a really high level of humidity. This technological system has been introduced firstly in China to meet those needs.

[96] J. Shan and M.A. Khan, "Implications of Reverse Innovation for Socio-Economic Sustainability: A Case Study of Philips China": p. 5.

Finally, another innovation which has firstly proliferated in the Chinese market is the touchscreen display for controlling Vortice's products. These kinds of products, in fact, are considered to be a must-have in China, while in Italy have not yet become the mainstream. They have been as well developed in the local R&D.

The innovations provided by Vortice seem to be responding to what are the local needs of the population and have been developed directly in China by the local R&D according to Chinese tastes. The branch of Changzhou, in fact, is autonomous for what concerns strategy and thus, has autonomy in deciding which products to introduce in China. Nevertheless, as confirmed by the interviewee, there has been a positive attitude towards these typologies of products from the Italian headquarter as well.

For what concerns the high-filtration system, due to Covid-19 and the constant requests of disinfection in the majority of closed buildings that is proliferating in every country of the world, the headquarter has requested from the Chinese branch these high-filtration systems. After a careful analysis of these products through the help of the Italian University Politecnico di Milano, Vortice understood that these ventilation units were successful as protection against the Virus. Thus, the headquarter decided to introduce in Europe this China-based innovation. In China the product is called IVU (Intelligent Ventilation Unit), in Italy, this product will be commercialized with the name Aria Salus. Together with the product, will be transferred to Italy as well the display for control, which was as well developed exclusively in and for China.

The second product described above had the same path. In fact, the ventilation system with integrated dehumidification has gained a strong interest from the headquarter. Some samples have already been sent in Italy and the conclusion of the HQ has been that there could be a lucrative market for these types of products in Europe as well. Thus, there is a high likelihood, if not the certainty, that these products will soon be commercialized in industrialized economies.

The last product mentioned, which has had a similar path, is the control display touchscreen which in China is considered a must have. This product, in fact, has been developed exactly in China and according to Chinese consumers' needs. The Asian Country represents for this product the primary market, and subsequently it will be introduced in Italy. This particular characteristic of a friendly interface had already been discovered in past research on Reverse Innovations related to the Chinese territory, especially in the case of Carel Industries[97].

4.2.2 Case 2: Emak

The second company Emak does not have an R&D center inside China, there is a small technical area which does the final validation, but the initial development is conducted in Italy. The technical director said that his willingness was to keep the know-how within the country. Nevertheless, the company is not just offering the same products that it commercializes in Europe to emerging economies. Rather, during the development, a differentiation takes place, and the family of product gets modelled according to the peculiarities of the market in which it will firstly be introduced.

The majority of products produced in China are those part of the price-sensitive segment and the plant in China is used as a bridge not only for the Chinese market, but for the whole Far Eastern market composed by several emerging economies, where these machines are sold successfully. However, these products which are thought and conceived for the Far Eastern market are not confined to those areas. Rather, they successfully trickle up and are subsequently sold in European countries or the United States as well.

[97] S. Corsi et al., "New Product Development in Emerging Economies: Innovation in Reverse from China", p. 236.

There are several examples of products conceived for the Far Eastern market which have then been introduced in the markets of industrialized economies. These products, in fact, are all available for purchase in the European website of the company. While in China and the whole Far East, for example, they are sold for intensive work, in Italy or in Europe, they are sold with a different value proposition, to those low-market segments or semi-professionals. Some of these products mentioned during the interview are: the Sparta 381S, Oleo-Mac GSH 510 or the Sparta 441 BP. These have all the characteristic of being born initially for the Far East but are as well offered in the European market as a low-cost product, or for the semi-professional segment.

Furthermore, not only these products are sold in industrialized economies, they actually have an immense success in these markets, sometimes even more than their Europe-based counterpart. For instance, some of the Far Eastern products represent the 70% of sales compared to their Italian counterpart. This is possible because Emak is able to sell a really competitive product in terms of price, which has at the same time a high level of reliability. As outlined by the interviewee, the big numbers are in the semi-professional market. While the machines developed for the European market and produced in Italy may be more efficient, they cover just a small portion of the market segment, the high-end one. Differently, the products thought for the Far East may be less valuable for what concerns quality, but at the same time, their price is drastically reduced, and are offered to the most populous market segment, namely, the semi-professional one.

One example of a characteristic peculiar to the products for the Far East is the power unit. The products thought for emerging markets have the peculiarity of interchangeability of components, basically, with the right components, you are able to fix your machines without the need of an expert. As the SMART initiative in the

research concerning Siemens mentioned in the literature review[98], also in this case, the company Emak has decided to provide to China and the emerging markets a maintenance friendly product. In fact, the choice of the introduction of the interchangeability of components was done in order to meet the needs of these emerging economies. These countries, as outlined by the interviewee, are characterized by a different approach compared to European countries for what concerns maintenance. In Europe, there is a well-developed system of after-sales services which is usually involved in the repairment of any machineries that stop functioning. When a product starts having some problems you just bring it to the seller who fixes it. Differently, in emerging countries like China, these post-sales services have not yet become the norm as they are in industrialized economies. Rather, there are plenty of small shops which can sell many different types of components. For this reason, having a product which can be fixed autonomously is an important characteristic that can increase your market penetration in these emerging economies. Thus, through this maintenance-friendly approach present in Emak's Far Eastern products the company is successfully modelling its innovations according to what are the local necessities of those customers. Subsequently, the same products, without modification and thus still with the interchangeability of components, are sold in Europe with a different value proposition. To those market segments price-sensitive and semi-professionals.

4.2.3 Case 3: Maschio Gaspardo

As previously mentioned, the Italian company Maschio Gaspardo has an R&D department inside China, in the city of Qingdao, together with a production plant. In this R&D center, the company has developed new products in order to meet the different characteristics of the Chinese market, as well the different purchasing power. This was needed because in the agricultural sector, agronomic techniques, soil

[98] N. Agarwal and A. Brem, "Frugal and Reverse Innovation - Literature Overview and Case Study Insights from a German MNC in India and China", p. 4-5.

conditions, and farmers' attitudes are sometimes different. Since it is needed to be in constant contact with local technical requests, the company has put in place this R&D department with this objective. It cooperates constantly with the Italian R&D center to develop machines that can have a good market in China.

The main example is the precision planter through which the company achieves the largest numbers in terms of revenues in China. Especially for what concerns precision planters for corn and soy, Maschio Gaspardo has successfully developed its products according to the necessities of the Chinese market. For instance, differently from Italy, in China corn is not sowed in a levelled soil, rather it is sowed on ridges. Thus, the company was able to provide to the Chinese market a particular precision planter which could have been useful in these conditions, a new machine which is not present in European markets.

Another product developed for the Chinese market is the paddy tiller machine. Also in this case, as mentioned by the interviewee, the agricultural techniques related to rice cultivation are different between Italy and China. The product for China needed to be adapted to the local way of cultivation which is based on the seedling of the rice's seed being transplanted directly into the mud, in the moist soil. A completely different style compared to the Italian way of cultivating rice. This machine as well, is not present in the European catalogues.

Finally, another product developed in the R&D center in Qingdao is the MTR Narrow. Maschio Gaspardo developed this product to answer to the local necessities of disposing 3 sowing units for soy at the distance of 22.5 cm. The sowing units are arranged in backhoes, which work on trunks of soils. There are two main reasons for this particular disposal of the soil, peculiar to the characteristics of the north-easter part of China, the main market for the agricultural machineries of Maschio Gaspardo China. The reasons for disposing the soil in ridges are the followings: first, the soil unfreezes

in April and it remains wet when the ice melts, the ridges are useful to speed up the soil drying process. Second, the ridges raise up the soil temperature in order to reach the seed germination temperature earlier. Without ridges, the planting season would be delayed for about 2 weeks and would make the crop life cycle shorter, since the summer season is shorter. Thus, Maschio Gaspardo has developed a precision planter adaptable to the precise characteristics of the Chinese soil, which as mentioned above, has ridges. Therefore, this innovation, called MTR Narrow and developed for China, has the characteristic of disposing 3 sowing units. With this product, Maschio Gaspardo was able to penetrate the local market, introducing something that was welcomed and needed by Chinese farmers. However, initially they could not introduce this product in European markets since this particular technique of using 3 sowing units all together is not practiced.

Nevertheless, while in Europe machines of this kind are not utilized, there are some areas using a similar technique, 2 sowing units. Given these similar necessities in some parts of the European market, the company made the decision to adapt the Chinese product to the European characteristics. In this way, from an idea born in the Chinese R&D center, Maschio Gaspardo has created a product that could have been used, after a slight modification, in part of the European market. In the industrialized countries this product is called the MTR Twin.

In general, the company Maschio Gaspardo has successfully provided to the Chinese market machineries which were meeting the needs of those customers. The different styles of cultivating rice or corn have implicated for Gaspardo the development of new products in order to sell in this particular market. Thus, the new plant in Qingdao, together with an R&D center, can be considered to be successful in meeting local needs and providing ad hoc products for Chinese customers, rather than only introducing the same products it commercializes in the West. However, differently from the cases of Vortice or Emak mentioned above, this particular sector of agricultural machineries

presents several characteristics which may hinder the possibility of selling the same Chinese machineries in countries like Italy, and thus, hinder Reverse Innovation.

Since agriculture has specific characteristics in each market, by satisfying the needs of Chinese consumers, it is hard to satisfy with the same products the needs of European consumers. For instance, the soil in which these products are used is definitely different from the Italian one. At the same time, the style of agriculture, as the example of rice's cultivating technique represents, can be an impediment for selling the same machineries developed for the Chinese market in Italy or Europe. In addition, other impediments that came out through the interview are concerned with homologations of the products, this is in line with regulatory barriers that were founded in a study on Reverse Innovation on the healthcare industry[99].
Nevertheless, despite these impediments, there has been one case, the MTR Narrow, that can be considered as a Reverse Innovation. The company, in fact, has innovated directly for China, and subsequently, with a small modification, it has been able to introduce the innovation in Western markets.

Therefore, to briefly summarize, the demand for these agricultural machineries in China is so different that the company, in order to meet the local needs, provides machines that in the majority of cases cannot have a profitable market in Europe and thus, the innovations for the Chinese market tend to remain confined to the Chinese market.

[99] V. Rowthorn, et al., "Legal and Regulatory Barriers to Reverse Innovation", Annals of Global Health, 2016, vol. 82, no. 6, p. 991-1000.

4.3 Discussion

Of all the cases presented above, the majority of them is a good example of Reverse Innovation. Reverse Innovation, in fact, means innovations that are firstly introduced in emerging economies and then trickle up to industrialized countries.

4.3.1 Summary

The path of Vortice's innovations seems to be in line with what had been discovered by past research. The company has an R&D center directly within the Chinese borders, through which it produced new innovations directly for the Chinese market. Subsequently, these products have been requested by the HQ in Italy since they were considered as good solutions also for the European market. Thus, the products introduced in China, with those characteristics that would have been welcomed by local consumers: High-filtration ventilation systems, integrated dehumidification, and touchscreen display for control, have been retransferred as such to industrialized economies. The case of Vortice shows the benefits deriving from companies deciding to innovate for China. By introducing those typologies of products, answering to the needs of the local population, Vortice has been able first of all to penetrate the Chinese market. Subsequently, after the requests of the HQ, the company has provided European markets with the same products that had been developed in China, creating new markets. The most significant example is the high-filtration ventilation system, in China it is used for purifying closed buildings from pollution, in Europe it will be used for disinfection against Covid-19.

The case of Emak is slightly different from Vortice. The Italian MNC involved in agricultural and forestry equipment, in fact, does not possess an R&D center within its Whole-Foreign-Owned Enterprise in China but several production plants and small technical areas. According to Reverse Innovation theory, this could be an impediment for creating products in line with local needs. However, the company is still developing

new machines in the Chinese market according to the local demand, rather than simply bringing the machines it produces and sell in Europe. The differentiation of the products takes place within the R&D center in Italy, where they are modelled according to their primary market. In this way, Emak is providing ad hoc products for the Chinese and emerging markets, which can be considered as being in line with local characteristics. First of all, they are definitely cheaper compared to the European products, an important attribute for selling better in countries with less purchasing power. Secondly, as the example of the interchangeability of components in the power unit represents, Emak introduces new peculiar characteristics like these maintenance-friendly products which, as demonstrated in the SMART Initiative of Siemens in past case studies, is an optimal tool for increasing the market share in emerging economies which lack a proper after-sales service.

At the same time, after having introduced these machines in the Far East, Emak is selling these innovations back to the European or American markets, proposing them with a different value proposition, tackling the price-sensitive market or semi-professional one. Thus, as the numerous examples provided by Reverse Innovation theorists, Emak, though its presence in China, is able to create cost-constrained innovations for the local market that have then successfully penetrated the industrialized low-market segment frequently disregarded by Western MNCs.

Finally, an important discovery has been taken place in the case of Maschio Gaspardo. The Italian MNC has established within China an R&D department exactly to meet the needs of Chinese farmers. However, in this case, the paradigm of Reverse Innovation does not work in the majority of innovations of Maschio. While past researches have covered different sector such as healthcare, they had never covered the agricultural machineries sector. Here, the agricultural techniques, the characteristics of the soil and the culture of the farmers are so specific to the territory in which they reside that may lead to the impossibility of Reverse Innovation.

Maschio Gaspardo, in order to meet the needs of local farmers and to penetrate the Chinese market, has developed peculiar products for the particular Chinese soil and techniques that, unfortunately, do not find a profitable market in Europe or Italy. Industrialized countries have in fact different techniques for cultivating soil, different culture, and are concentrated on cultivation of different types of products.

However, despite all these differences, there is one particular product which has generated a reversal of the traditional innovation flow. The MTR Narrow described above, in fact, had been developed exactly for the Chinese market and had physical characteristics that made its use possible only for the Chinese market. Nonetheless, while in Europe those characteristics peculiar to the MTR Narrow are not used, there are areas which make use of a similar technique. Thus, Maschio Gaspardo has first introduced this new innovation in the Chinese market, subsequently, the company decided to slightly modify the machine to make it sellable in other markets, and introduce it in world catalogues.

4.3.2 Reverse Innovation in Italian companies

The analysis conducted has shown that the Italian companies under scrutiny are good examples of Reverse Innovation. This confirms the idea of Govindarajan and Trimble which said that China has become a country in which MNCs decide to introduce new products. Not only, the placement of R&D activities within China shows as well the transition that the country is having, shifting from merely production at low-cost to the highest value-added activities. All the companies studied have confirmed the high importance that MNCs are giving nowadays to the Chinese market. Moreover, in the majority of cases, this focus on satisfying the local needs has proved successful also for their European market. As the theory of Reverse Innovation suggested, by innovating for China, MNCs would have products ready to be easily introduced in Western markets, creating new markets, or satisfying the needs of low-end consumers. Nevertheless, there are some exceptions. The case of Maschio Gaspardo, in fact, has introduced a new limitation that could hinder the likelihood of Reverse Innovation.

When a certain industry requires really specific innovations, as the case of agricultural machines represented, the same products introduced for the Chinese market will hardly be sellable in countries that have different characteristics.

4.3.3 Which type of Reverse Innovation?

To conclude the research and to label the cases encountered in this study, following the linear model developed by Corsi et al. present at page 31 of this dissertation, we can give a definition to the different innovations in this dissertation.

In the first case, Vortice, the innovations introduced by the Italian company can Be considered as Reversed PLC (Product's Life Cycle). These products, in fact, are ideated by the local R&D center and are developed in China. Following their creation, they are first launched in China, which represents the primary market, and subsequently are introduced in industrialized economies. Being Reversed PLC, we can consider Vortice's innovations as Strong Reverse Innovations.

The products of Emak instead, have a different path. They can be considered as Spill-back Innovations. They are, in fact, conceived and developed in the R&D center present in Italy, thus, in an industrialized economy. Nevertheless, their primary market is the Far Eastern one, where China is undoubtedly the largest. Subsequently, the same products are then brought to industrialized economies with a different value proposition. Given this path, it can be considered as a Weak form of Reverse Innovation.

Finally, for the majority of innovations introduced in the Chinese market, Maschio Gaspardo, due to the peculiar characteristics of the agricultural sector, cannot be considered as a successful example of Reverse Innovation. The company meets the local needs of the population by conceiving and developing products directly within

the Chinese market through their local R&D center in Qingdao, according to the local technical requests. Nevertheless, since the agricultural machineries' sector presents many impediments that do not permit the Italian company to bring the same products back to Italy or other European countries, these products are introduced and confined in China. Given these characteristics, they would be labelled by Corsi Developing Country-Only innovations. There is just one case that can be considered as a Reverse Innovation, especially a Reversed PLC (Product's Life Cycle). The MTR Narrow, which was developed and introduced in China and subsequently in Europe has been offered as the MTR Twin.

Name of the company and industry	R&D center in China	Introductions of new products according to Chinese needs	Reverse Innovation: introduction in Western markets	Which type of Reverse Innovation?
Vortice; ventilation systems, air treatment solutions.	Yes	High-filtration ventilation systems; integrated dehumidification; Touchscreen display for control.	Yes, in all three cases: products proposed in new market segments.	**Reversed PLC**: Conception in emerging market; Development in emerging market; primary market in emerging market; secondary market in advanced countries.
Emak: gardening, agriculture, and forestry equipment.	No, just a small technical area.	Low-cost products; new peculiarities like interchangeability of components; removal of expensive features.	Yes: products offered with a different value-proposition, targeting low-market segments.	**Spill-back innovation**: Conception in advanced country; development in advanced country; primary market in emerging market; secondary market in advanced countries.
Maschio Gaspardo: agricultural machineries for sowing, tillage, crop treatment, and hayloft.	Yes	Precision planter; paddy tiller machine; MTR Narrow.	No in the majority of cases: peculiar local conditions hinder Reverse Innovation. Yes for the MTR Narrow after adaptation.	For the majority of cases, **developing-country only innovation**. For the MTR Narrow, **Reversed PLC.**

Chapter 5: Conclusion

5.1 Overall Conclusion

The theory of Reverse Innovation has developed recently and has gained interest in innovation studies. Emerging economies like China have become crucial actors for companies willing to innovate. Nowadays, differently from the past, MNCs take largely into consideration emerging economies' consumer needs when deciding which products to provide to those markets. The academic piece of Vernon, the product's life cycle, which suggested that innovations develop in industrialized economies, and then get transferred as such to developing countries, has been disproved by current trends concerning Global Innovations. At least this was sure for extremely large MNCs like General Electric or Philips, which have started to innovate directly for emerging economies, producing innovations that are exactly satisfying those needs, and then reselling these products as such in industrialized markets.

Given the importance of the concept of Reverse Innovation and the disruptive changes in the world of global innovation that it is bringing nowadays, an analysis of Italian MNCs was needed to understand whether the theory applies also for those Italian companies. This research has mainly concentrated on the mechanical industry being it one of the most representative of the Italian economy. However, another important difference in this dissertation compared to past research, is the size of the companies studied. They, in fact, despite being MNCs, have a much smaller number of employees and of revenues compared to GE, Philips, Siemens and all the MNCs studied in light of this phenomenon. Therefore, understanding the applicability of the theory in smaller enterprises is another contribution that this research is bringing to the academic literature.

5.1.1 Is Reverse Innovation feasible for the Italian Mechanical Sector?

To answer the initial questions of this research, the Italian Mechanical sector, despite the smaller size of its companies, is suitable for Reverse Innovation. As the cases described in this research represent, the Italian companies under scrutiny are developing innovations peculiar to Chinese characteristics. Subsequently, these products have seen a positive demand also in industrialized markets, and have been retransferred there as such, with no or slight modifications. This proves that these types of companies, despite being smaller in size, should start innovating for emerging economies rather than trying to sell innovations that were successful in the West. In fact, by developing new products for China, the firms under scrutiny not only have been able to penetrate the local market, but they have also provided industrialized markets' consumers with new products, tackling low-markets segments or directly creating new markets. By using the linear innovation framework developed by Corsi, the researcher has been able to successfully label the innovations encountered as Strong or Weak Reverse Innovation.

Vortice, with its innovations, has created new markets in Europe through its Chinese products. It has been able to offer solutions for disinfection against covid-19 with the high-filtration ventilation system that was developed for China. It has offered solutions for dehumidification to industrialized economies with products that were initially born for satisfying Chinese consumers' high-end needs. It has developed a peculiar touchscreen display in China, considered a must-have in the Asian Country, that has then been transferred as well to European markets.

Emak, with their low-cost approach to the Chinese market has been able to develop peculiar products, less expensive but still highly reliable, which would have firstly been able to penetrate emerging economies markets. Subsequently, the company has decided to sell the same products in the European market with a different value proposition. These products have successfully penetrated the low-end market or the semi-professional segment, usually disregarded by MNCs, with high rates of sales.

Maschio Gaspardo, instead, is a significant example that shows that some particular industries may present some intrinsic factors that do not permit the same innovations developed for the peculiar characteristics of the Chinese market to be resold in industrialized economies. Nevertheless, despite these limitations, there is still one case that successfully developed in China and subsequently, after a small modification, entered the industrialized countries' catalogues.

5.1.2 How do Italian companies engage in Reverse Innovation?

From the case-studies is understandable that the companies involved are pursuing Reverse Innovation, but in different ways. Vortice and Maschio Gaspardo have their local R&D center through which they are able to develop new innovations tackling Chinese needs. Subsequently, these products are transferred, where possible, to industrialized economies' markets. These would be called by Corsi et al. as Strong Reverse Innovation. Differently, Emak does not possesses a Chinese R&D, however, this does not imply that the company is not able to provide peculiar product for Chinese consumers. In fact, the differentiation of new products, according to local market characteristics, takes place but within Italy. The products initially directed to the Far Eastern market, among which China is definitely the largest, are then sold in European markets targeting low-end or semi-professional segments. An example of Weak Reverse Innovation.

5.1.3 Limitations to Reverse Innovation

Finally, another important discovery took place during the research related to the reasons for not pursuing Reverse Innovation in the case of Maschio Gaspardo. In the sector of agricultural machineries, in fact, there are some industry-specific factors that hinder the capability of those products developed in China to find a positive demand in industrialized economies. Being the characteristics of agriculture so peculiar to the local market: different soil, different culture, different techniques; by providing products exactly for those peculiar characteristics, it is hard to find the same conditions

in industrialized economies which present some differences in those aspects. Thus, while Reverse Innovation is feasible for the majority of cases, there are some sectors where the theory does not work, the agricultural machineries being one of them.

5.1.4 Key takeaways

This dissertation is in line with past research about Reverse Innovation theory and confirms the feasibility of this phenomenon concerning Italian companies part of the mechanical sector which, at the same time, are much smaller in terms of employees and revenues compared to past studies. By proving the applicability of Reverse Innovation, this dissertation confirms the importance that China is gaining nowadays in the world of Innovation. Not only large MNCs are innovating for China and then offering these products in the West, reversing the product's life cycle. The same phenomenon is happening to some companies of the Italian mechanical industry. This positivity towards the Chinese market is confirmed as well by a recent survey conducted by the Italian Chamber of Commerce in China[100].

Thus, not only the international giants like General Electric, Siemens and Philips have understood the importance of the Celestial Empire, rather, smaller Italian companies are part of the group and are shifting more resources towards these emerging economies. China should not be considered anymore a pool of already-successful Western innovations, rather, it is the locus where new innovations get introduced, and from there depart to reach industrialized economies' markets. Nonetheless, some industry-specific factors may lead, as the case of Maschio Gaspardo represents, to the impossibility of achieving Reverse Innovation. These factors are based on peculiar differences present within China's borders, namely, the local culture, the local agricultural techniques, and the local soil's characteristics.

[100] Albricci P.P., "Il 70% dei manager italiani in Cina è molto ottimista sui prossimi 5 anni", China Economic Information Service, https://www.classxhsilkroad.it/news/politica-economica/il-70-dei-manager-italiani-in-cina-e-molto-ottimista-sui-prossimi-5-anni-202102151907406546, February 12, 2021. Accessed March 11, 2021.

5.2 Suggestions for further Research

This research has understood that Reverse Innovation takes place also for what concerns Italian companies, part of the mechanical sector. These companies are much smaller in size compared to former research, nevertheless, this is not an impediment for innovating according to local needs and then proposing these innovations to industrialized economies.

However, Reverse Innovation theory is still lacking case studies as the one provided by this research. The majority of papers present in the literature are stuck to conceptualization of the term, while few of them are concrete representation of how MNCs can embark in this process. There could be some sectors, as the case of Maschio Gaspardo represents, where Reverse Innovation is not as straightforward as thought in past research. Thus, new case studies understanding whether there can be impediments due to peculiar industry conditions in the likelihood of Reverse Innovation are needed.

Furthermore, another area of interest in which a careful analysis in light of Reverse Innovation should take place is the automotive sector. China, nowadays, is at the front of innovation for what concerns electric vehicles. While the automotive sector has always been dominated by Western car-making companies, the development of EVs could disrupt this trend, by shifting the locus of innovation towards China. In the next few years, there is a high likelihood that the Chinese automotive sector will expand dramatically, winning the competition against Western MNCs. China has already the largest number of EVs than any other countries in the world and has the largest infrastructure as well (charging stations)[101]. Moreover, given the current focus on CO2 emissions' reduction in Western countries, it is just a matter of time before Western

[101] A. Thornton, "China is winning the electric vehicle race", World Economic Forum, February 9, 2019, accessed March 24, 2021: https://www.weforum.org/agenda/2019/02/china-is-winning-the-electric-vehicle-race/

automakers will shift their core production towards electric vehicles. By starting innovating for China now, listening to local needs, namely EVs, Western companies could have in the near future electric vehicles that could be easily introduced in Europe or the US before their competitors, winning the fierce competition that characterizes that sector. A clear example of one company that is embarking in this process is General Motors. The American company has understood the importance of the EV market in China and, through its joint venture with SAIC and Wuling Automobile has already created an electric car for the Chinese market which, according to many analysts, has the possibility of disrupting the automotive sector. The so-called Wuling Hong Guang Mini EV, launched in July 2020 has already become popular, especially thanks to its price of RMB 28.000 ($4.460), and Western consumers are just waiting the car to be introduced in their countries' markets for purchasing it[102].

Thus, being China so crucial for innovation in this sector, applying the Reverse Innovation paradigm to EV would be an important contribution.

[102] S. Tabeta, "Look out Tesla, SAIC's $4,500 electric car takes China by storm", Financial Times, February 25, 2021, accessed March 24, 2021: https://www.ft.com/content/2cd43afc-0663-47aa-9c30-a3b50483dbc7

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Interviews

The interviews used to complement the research have been conducted remotely, through various apps like Microsoft Teams, Wechat, and Zoom. It was impossible to conduct the interview face-to-face due to the constraints for the Covid-19 pandemic. Moreover, two of the interviewees were located in China, thus the only possible means to conduct the interview, given the restrictions to enter into the PRC, was through virtual meeting.

Company	**Interviewees**	**Position**	**Time**
Vortice	Christian Mussner	Technical and Operations Director of Vortice Changzhou	55 minutes
Emak	Marco Ferrari	Technical Director Emak	60 minutes
Maschio Gaspardo	Diego Ranzato	Asia Sales Manager Maschio Gaspardo	60 minutes

Summary

The global flow of innovation has been usually considered as follows: an innovation gets introduced in a developed economy, meeting the local needs of the population. After having become popular in the country of origin, it gets exported as such to other developed economies first, and then to emerging economies. In some cases, after a cost-minimization consideration, a FDI could take place, and the innovation might start to be produced in an emerging market given the lower costs of labor. This was well-captured in Raymond Vernon's academic piece, which spoke about the Product's Life Cycle.

Nowadays, however, the fast development of countries such as India and China is redrawing the traditional innovation flow through a new phenomenon called Reverse Innovation, which, briefly speaking, can be summarized as the opposite of the Product's Life Cycle. As a matter of fact, nowadays, we are seeing more and more innovations that get introduced in emerging economies, and then trickle-up and start to be exported to developed economies. This concept, studied and conceptualized by Govindarajan and Trimble in 2009, needs to be taken carefully into consideration by western MNCs with foreign subsidiaries and foreign market shares.

In their famous book "*Reverse Innovation: Create Far from Home, Win Everywhere",* are present several examples on how large Western companies are pursuing Reverse Innovation. From General Electric to Logitech, it is evident that the behavior towards emerging economies is changing. Differently from the past, simply exporting your innovations developed in the West for Western consumers will not take you too far in an emerging market. Reverse Innovation, in fact, involves international MNCs to develop new peculiar products that are in line with the local needs of emerging countries' consumers. Frequently through the establishment of a Research and Development center directly within these emerging economies, some companies have

been successful in providing to the local consumer base a cheaper and functional product which has first, successfully penetrated the local emerging market, and subsequently, it has completed the Reverse Innovation flow by being marketed in the West as well. This strategy will help your MNC by increasing your market penetration in emerging markets, and, at the same time, by providing a new product with new innovative features at a much lower price in developed economies.

Following the conceptualization of Govindarajan and Trimble, large international MNCs like General Electric, Siemens, Philips and so on, have been analyzed by various scholars in light of this new phenomenon. A clear example was General Electric. The American company, for instance, was struggling in penetrating the healthcare market in China with its Western and costly innovations. Subsequently, they decided to develop a peculiar portable ultrasound system through their local Chinese R&D center. Despite not being of the same quality as the products General Electric provides to Western markets, this innovative machine had all the necessary characteristics to become popular in a country with a consumer base characterized by lower purchasing power. Indeed, it was functional and cheap. Through this innovation, the company was able to successfully penetrate the healthcare industry, especially in the rural areas of China. At subsequent stages, the management of GE decided to bring back to Western markets this product, completing the Reverse Innovation flow.

Siemens as well introduced what is called the SMART initiative: providing products which are Simple, Maintenance-friendly, Affordable, Reliable and Timely-to-market. The scope was to penetrate the low-end market of China, characterized by an extremely large consumer base but with a lower purchasing power compared to the West. Also in this case, the German company successfully introduced in the Asian country new products which have been welcomed by the local consumers, allowing it to penetrate some market segments in which was not yet present. Subsequently, also in this case, some of those innovations, especially the ones related to the healthcare

industry such as the *Magneto Resonance* and the *Computed Tomography*, completed the Reverse Innovation flow by being marketed in the West.

This research answers to the request of Govindarajan to provide more case studies representing this phenomenon. In particular, this research has been narrowed down to Italian companies, especially those part of the Mechanical Sector, being it one of the most successful and representative of the Italian economy. As well, another characteristic which differentiates this study from the ones conducted up to now, is the fact that the companies under scrutiny are much smaller in terms of revenues and employees compared to the ones analyzed up to now. This difference may hinder the feasibility of Reverse Innovation.
To summarize, the question to which this dissertation answers are: "is Reverse Innovation feasible for the Italian Mechanical Sector?" and "How do Italian companies engage in Reverse Innovation?"

Three companies have been examined: Vortice Elettrosociali, Emak, and Maschio Gaspardo The whole research has been conducted as follows: first of all, information has been retrieved through various sources. The companies' profiles have been analyzed carefully, together with various newspaper, journals, and database such as Factiva and Orbis (Burau Van Dijk). After this extensive research, a request for an interview has been sent to the companies through LinkedIn and Rocket Reach. The Public Relation departments of the companies have welcomed the request and have allowed the researcher to conduct semi-structured interviews with one manager of each company.

The first company analyzed is Vortice. The Italian MNC has established since 2013 a Research and Development Center in the city of Changzhou through which it provides the local market with new innovative solutions, different from the ones provided to the European markets. Vortice is an Italian multinational corporation which is specialized

in the production of technological air solutions. According to the company profile, they provide different solutions for its customers: "efficient air solutions; central air exchange system with heat recovery; air-conditioning in domestic environments; ventilation in hospitals and/or industrial environments; destratification of warehouses and/or shopping centers."[103]

The second company is Emak. They do not have an R&D center inside China, but there is a small technical area inside the production plant in the city of Zuhai. The initial development, as mentioned by the technical director interviewed, is conducted in Italy. Nevertheless, the company is not just offering the same products that it develops and commercializes in Europe to emerging economies. Rather, during the development, a differentiation takes place, and the family of product gets modelled according to the peculiarities of the market in which they will be firstly introduced. These can be the European market or the Far Eastern market.

The majority of products produced in China are those part of the price-sensitive segment and the plant in China is used as a bridge not only for the Chinese market, but for the whole Far Eastern market composed by several emerging economies, where these machines are sold successfully.

The last company analyzed is Maschio Gaspardo. This Italian company considered an international leader for what concerns the production of agricultural machineries. It has 8 different plants worldwide, five in Italy, one in Romania, one in India and one in China. It was founded in 1964 and has constantly grown since its start of operations. Specifically, "the Group produces a wide range of rotary tillers, power harrows, mulchers, precision planters, cereal seed drills, combination cultivator-drills, flail-mowers, ploughs, minimum tillage, spraying and hay making equipment"[104]. It has an

[103] Vortice S.p.A.,"Vortice Company Profile", accessed March 6, 2021 https://www.vortice.com/en/
[104] Maschio Gaspardo, "The Group and its History", accessed February 21, 2021. https://www.maschio.com/menu-istituzionale-en-GB/the-company/the-group-and-its-history/

R&D center in the city of Qingdao through which it provides new machineries peculiar to the Chinese market.
There are commonalities among the companies analyzed. Each of them, in fact, is providing new peculiar innovations for the Chinese market, rather than simply exporting already-successful products previously introduced in the West.

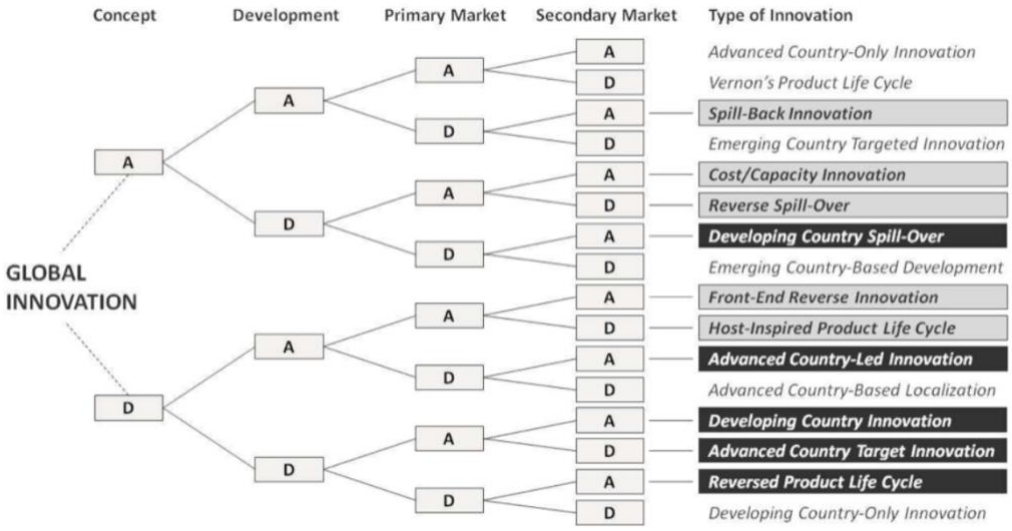
In the case of Vortice, three particular products have been mentioned by the Technical Director of the Changzhou branch interviewed: the IVU, the system with integrated dehumidification and the touchscreen controller. These are all products that have been created for the Chinese market and are being successful in the emerging economy. Nevertheless, they are not destined to be stuck in China. In fact, after a discussion with the HQ, it has been decided that these products will trickle-up from the Asian country and will start to be introduced in Italian and European catalogues.

In the case of Emak, the company does not possess and R&D in China. However, it differentiates its products according to the market of entry (Asian market or European one) during the development in Italy. This means that the products that are offered to East Asian consumers are different from the ones that the company introduces in Italy. They have the characteristic of being much cheaper, but at the same time, do not possess all the functionalities of the Italian products. Nonetheless, these products are not only successful in China, rather, they are being sold successfully in Italy and Europe as well. Moreover, as confirmed by the interviewee, these products are capable of achieving higher rates of sales compared to Italian-made products when they are introduced in the Italian and European market. This is possible because they meet the needs of the semi-professional markets, those consumers who do not need a costly and sophisticated machine, but are rather satisfied with a simple and cheaper product.

Finally, Maschio Gaspardo, has an R&D center in the city of Qingdao through which it satisfies the local Chinese needs by producing ad hoc agricultural machineries. In

fact, the soil conditions, the way of cultivating, the culture of the agriculture in general is completely different in China compared to Italy or Europe. For this reason, an R&D center is necessary in order to penetrate the Chinese market. In this case, however, differently from Vortice and Emak, the company has more difficulties in introducing the products it develops in China to the European market. Being the Chinese products of Maschio so peculiar to the local conditions, they are unsellable in Europe. This leads to an impediment in achieving Reverse Innovation. However, there was one product, the Chinese MTR Narrow which in Europe is being sold as the MTR Twin, which can be considered as a successful case of Reverse Innovation.

In order to provide a definition of the various products encountered during the research, the following scheme developed by Simone Corsi et al. has been extremely useful to understand whether Reverse Innovation was present or not.



Reverse Innovation linear framework[105], S. Corsi et al., "A Typology of Reverse Innovation".

[105] S. Corsi et al., "A Typology of Reverse Innovation", Journal of Product Innovation Management, 2015, 32(1), p: 12-28: p. 16.

The table below summarizes the Research findings.

Name of the company and industry	**R&D center in China**	**Introductions of new products according to Chinese needs**	**Reverse Innovation: introduction in Western markets**	**Which type of Reverse Innovation?**
Vortice; ventilation systems, air treatment solutions.	Yes	High-filtration ventilation systems; integrated dehumidification; Touchscreen display for control.	Yes, in all three cases: products proposed in new market segments.	**Reversed PLC**: Conception in emerging market; Development in emerging market; primary market in emerging market; secondary market in advanced countries.
Emak: gardening, agriculture, and forestry equipment.	No, just a small technical area.	Low-cost products; new peculiarities like interchangeability of components; removal of expensive features.	Yes: products offered with a different value-proposition, targeting low-market segments.	**Spill-back innovation**: Conception in advanced country; development in advanced country; primary market in emerging market; secondary market in advanced countries.
Maschio Gaspardo: agricultural machineries for sowing, tillage, crop treatment, and hayloft.	Yes	Precision planter; paddy tiller machine; MTR Narrow.	No in the majority of cases: peculiar local conditions hinder Reverse Innovation. Yes for the MTR Narrow after adaptation.	For the majority of cases, **developing-country only innovation**. For the MTR Narrow, **Reversed PLC.**

To conclude, this dissertation confirms the feasibility of Reverse Innovation for the Italian companies part of the mechanical sector. They are, albeit differently, engaging in this new phenomenon. Vortice's innovations, considering the linear framework developed by Corsi et al., are to be considered Strong Reverse Innovations. In fact, the conceptualization and development of Vortice's products take place directly within the Asian Country's R&D, their primary market is China, and subsequently are introduced in industrialized economies. Emak's products have a different path. Conceptualization and development take indeed place in Italy, but the primary market is still an emerging market, in this case the Far Eastern market among which China is the largest one. Subsequently, however, the same products are introduced in the Italian and European catalogues, representing what are called as Weak Reverse Innovations. Finally, Maschio Gaspardo conceptualizes and develops its Chinese products directly in its R&D center in Qingdao. The primary market is China, but, differently from the other companies under scrutiny, for the majority of cases the products are not introduced back in Italy or Europe. These would be called as Developing-country-only innovations, a form of Traditional Innovations. Nevertheless, there is one product, the MTR Narrow, which trickled up from the Chinese market to the European one. Such product can be considered as a Strong Reverse Innovation.

Thus, to answer the research question, Reverse Innovation, for what concerns the Italian Mechanical Sector is to be considered feasible. The companies analyzed, albeit differently, are delivering new innovations for Chinese consumers which then, in subsequent stages, export to industrialized economies. Nevertheless, it is worth noticing the case of Maschio Gaspardo. The agricultural machineries' sector, in fact, requires the Italian company to develop products which are too peculiar to the Chinese conditions (soil, culture, way of cultivating, etc). This may impede the introduction of these products back to Italy or Europe. Thus, despite Reverse Innovation is to be considered feasible for the Italian Mechanical sector, there can be some exceptions.

Acknowledgments

First, I would like to deeply thank Professor Andrea Filippetti. It is only thanks to his support and advice throughout the whole period of writing the thesis that I have been able to present this research. I will always be grateful for his kindness and his lectures during the academic year.

I would like to thank my university and all the people that I encountered during this amazing journey. When I first entered that beautiful building in Viale Romania I was just a kid; now I leave with much more knowledge, friends, and eagerness to become successful in my career.

Last but not least, I want to thank my family. In my dark periods, they were the only ones who still believed in me. I arrived this far only thanks to your support. I will always be in debt with you for all the sacrifices you did for me. My goal in life is to make you proud.