

# FIRM HETEROGENEITY AND LOCATION CHOICE OF GERMAN MULTINATIONAL FIRMS



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## **ABSTRACT**

In this paper we examine how different host country characteristics affect the location decisions of German multinational firms in developing and transition countries, paying particular attention to the sectoral composition of foreign direct investment (FDI). The study is focused on a broad sample of 22,533 foreign affiliates established in 145 countries over the period 1990 to 2015. A logit model has been employed to carry it out. The results suggest that market size, human capital, information and communication technology (ICT) infrastructures and surprisingly, the level of corruption, have a positive effect on the decisions of German multinationals to engage in FDI in both developing and transition economies. However, labor costs, distance between parent and host country and macroeconomic instability are factors which avoid the entrance of German firms in those countries. Finally, as for the agglomeration effects, interesting differences between manufacturing and services sector have been found.

**JEL classification:** F21; F23; R39.

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# **FIRM HETEROGENEITY AND LOCATION CHOICE OF GERMAN MULTINATIONAL FIRMS**

## **1. INTRODUCTION**

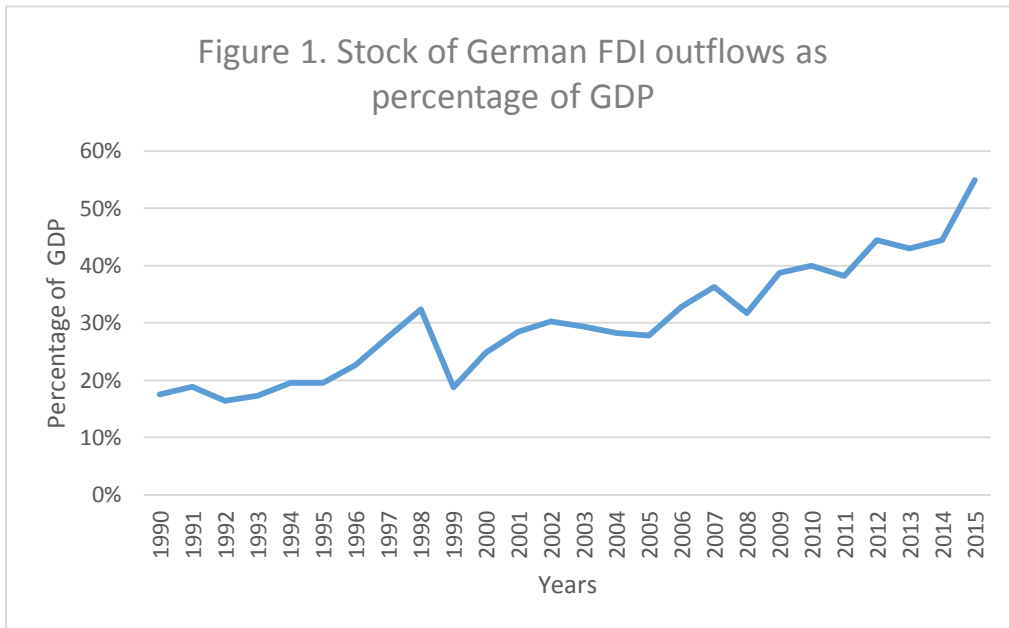
Multinational companies (MNCs) have played an important role in the process of globalization. Over the last decades, the world has experienced a huge increase in the activities of transnational firms. As a consequence, worldwide foreign direct investment (FDI) has risen considerably, exercising a decisive influence on the growth of countries and changing the investment patterns around the world. Moreover, another remarkable characteristic in the landscape of worldwide investment is the growing relevance of developing and transition economies as recipients of these flows. Traditionally, this field has been dominated by developed economies. They have simultaneously been the main origin and destination of international investment. However, this tendency has recently been reverted, and developing and transition economies have been emerging since the end of the last century as increasingly important places to invest. Furthermore, not only developing economies have increased their significance as potential destinations, but they are also vital investors.

Additionally, the sectoral composition of these flows has changed to an almost unbelievable extent. It has mainly been characterized by a huge increase in FDI in services and a significant drop in the manufacturing sector.

In spite of these recent events, however, research remains focused on the investment among developed countries and on the determinants in their manufacturing sectors. Nevertheless, the factors that affect FDI in developing economies may be different from those that are relevant to developed countries (Bloniguen and Wang, 2005). Similarly, it is possible to find significant differences in the determinants across sectors. This is consistent with the results obtained by Py and Hatem (2010), which show that there are different patterns in the decisions of MNCs to engage in FDI in the manufacturing or in the services sector.

In this work, we investigate how different host country characteristics affect the decision of German MNCs to locate in a large sample of developing and transition countries, and whether these determinants change between manufacturing and services firms. The size of the German economy and its remarkable behavior in FDI flows makes it a really interesting case to study the determinants of the location of foreign affiliates in developing countries by sectors.

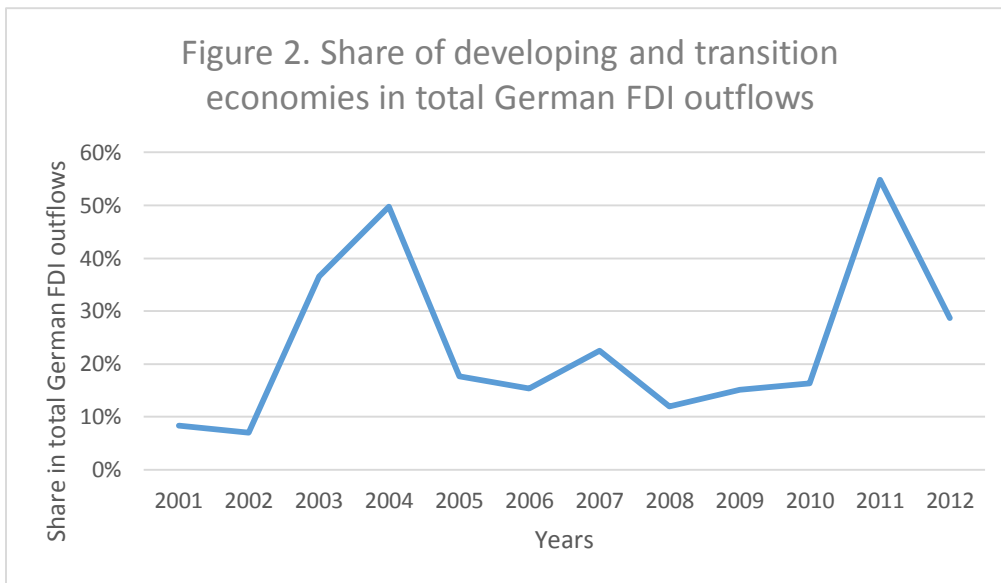
Nowadays, Germany is one of the largest economies in the world. According to the World Bank, it is the fourth economy in the world and the first economic power in Europe. Thus, taking into account these data together with the geographical proximity with the economies in transition, there is no doubt about the potential relevance of Germany in the FDI for the target countries in this work. Indeed, in 2015 Germany was the sixth investor economy in the entire world. Figure 1 shows the stock of FDI outflows as a percentage of its GDP for the last twenty-five years.



Source: Own elaboration based on UNCTAD database.

As can be appreciated in Figure 1, Germany's cumulative investment abroad represented 17% of its GDP in the early 1990s. By 2015 it had become 55% of its GDP. So, the process of internationalization and globalization which has affected the world in the last two decades has boosted the German FDI to become a notable proportion of its GDP.

Our work, however, focuses only on the location decisions of German MNCs outflows to developing and transition countries. Figure 2 shows the percentage of the total German FDI outflows of those destined to developing and transition economies between 2001 and 2012.



Source: Own elaboration based on bilateral statistics UNCTAD database.

As we can see in Figure 2, despite the significant fluctuations of FDI outflows to developing and transition countries that have taken place during this period, there has been a notable increase of these flows. In 2001 the share of developing and transition countries as recipients of German outward FDI represented approximately 7%. Yet, in 2012 they reached a percentage of 29% of the total German FDI outflows. It is also remarkable that there are years, as in the case of 2004 and 2011, in which more than half of the total flows were addressed to these economies. Furthermore, from 2003 to the present the minimum share of developing and transition countries in the German FDI outflows has never been less than 12%.

The factors and determinants which have the greatest impact on the location decisions of MNCs are neither simple nor few in number. In addition, they have been broadly studied from a large number of points of view and scientific fields related to worldwide investment, such as international business, industrial organization, international economics and, more recently, from the New Economic Geography. Following the current literature, in our work we include the most commonly used determinants of location decision of FDI, such as the size of the host and surrounding markets, the level of income per capita of the recipient economy, the availability of skilled workers, the distance between origin and host country, the existence of agglomeration effects, infrastructures such as information and communication technologies (ICT), macroeconomic instability, and level of corruption.

In order to know the different effects of location factors in the decisions of German transnational companies, a logit model was employed. The main findings of our work are the following. Firstly, it is shown that market size, human capital, ICT infrastructures, and macroeconomic stability in the host country, as well as the proximity between parent and

host country stimulate the location choice of German MNCs in developing and transition economies. Secondly, the effect of agglomeration externalities, although they are always significant, is observed to differ depending on both the sector activity and the nationality of the competitors. In manufacturing, the positive spillovers of the agglomeration of other German MNCs dominate in the attraction of FDI. However, the effect of increased competition associated with the agglomeration of foreign MNCs in the host country seems to deter the entry of German MNCs. In services the effects are just the opposite. Thirdly, our estimates indicate a negative and significant influence of higher labor costs in the location decision of MNCs in both sectors: manufacturing and services. Finally, a surprising but robust result is the positive effect of corruption on the foreign investment decisions of German MNCs.

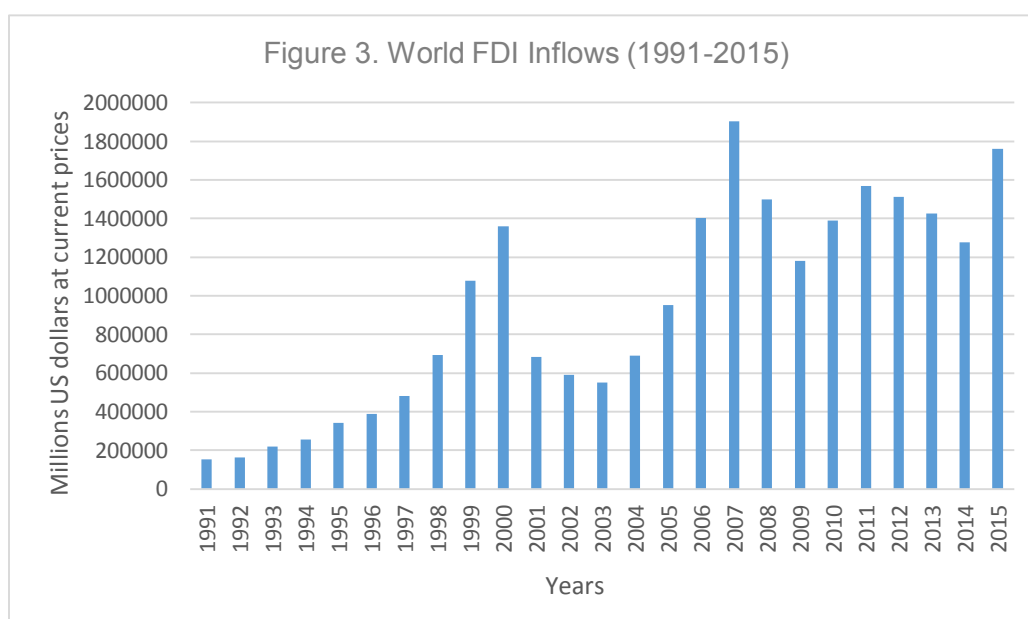
The rest of the paper is organized as follows. Section 2 describes in greater detail the current developments in global investment and its causes. Section 3 presents a review of the literature on the different types of FDI and the locational determinants of multinationals. Section 4 shows the database and the econometric model used in our research. Section 5 explains the results of the estimation and the final section concludes.

## 2. CURRENT FOREIGN DIRECT INVESTMENT FRAMEWORK

### 2.1. Current FDI trends

Multinational companies have increased their activity notably around the world in the last three decades, having a great impact on the last wave of globalization<sup>1</sup>. In consequence, worldwide FDI has undergone a significant rise, becoming one of the most remarkable factors for the economic growth of different countries and changing the patterns of the worldwide economy. This fact can be reflected in the important boost which FDI has experienced, in both inflows and outflows.

Figure 3 shows the evolution of world FDI inflows for the last twenty-five years, measured in millions of US dollars at current prices.



Source: Own elaboration based on UNCTAD database.

As can be seen in Figure 3, the value of FDI inflows in 1991 was about 153,981 million US dollars at current prices, and in 2015 they had reached a value more than 11 times higher, as it accounted for 1.76 trillion US dollars at current prices. However, although FDI inwards have experienced a huge growth over the last twenty-five years, this has not occurred at a constant rate as there have been several fluctuations. They increased considerably between 1991 and 2000, but a sharp decrease in the stock market activity in major industrial economies in 2001 reversed the situation, as a sharp fall took place (UNCTAD 2002:3). Subsequently, the rate of growth was regained, and in 2007 the highest value of FDI inflows was registered, reaching a value of 1.9 trillion US dollars at current prices. Nevertheless, the economic crisis prevented FDI inflows from continuing to grow at a prosperous rate, and as a consequence between 2007 and 2015 different

<sup>1</sup> See Dunning (1998).

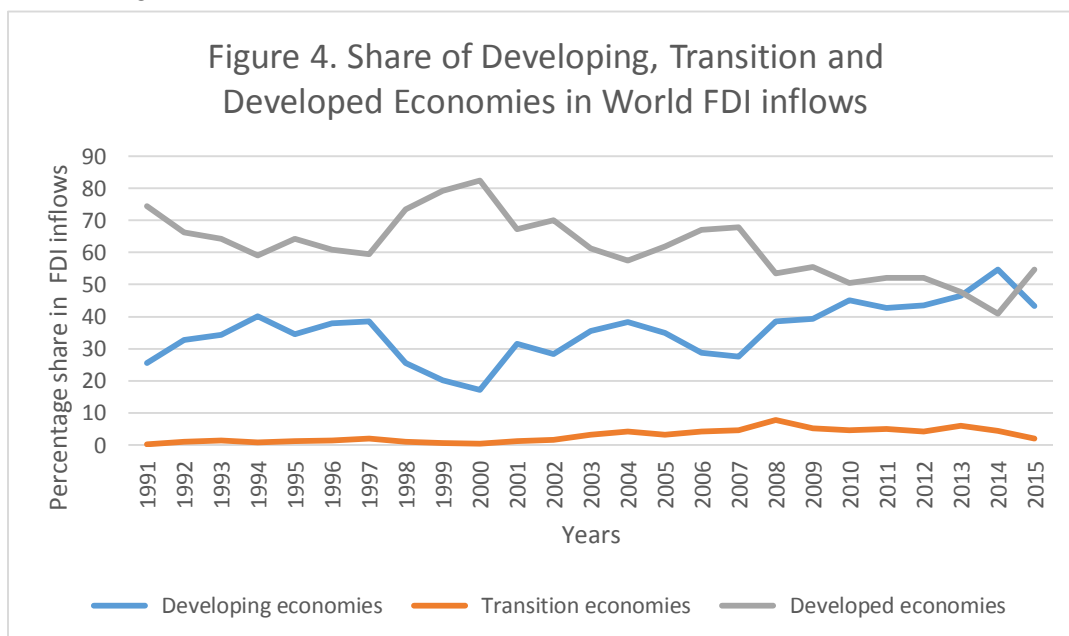


oscillations in their levels were produced. In 2015, the last year for which data are available, there was a rise with respect to 2014, due to the slow recovery of the economy and an important surge in cross-border M&As, especially in developed countries (UNCTAD 2016: 3).

As for the value of FDI outflows, it is nearly equal to the value of FDI inflows. It is reasonable to think that they must coincide, because if a flow exits from one country, it must enter another country. However, there are differences between them in terms of value, due to the fact that home and host economies may use different methods to collect data and different times for recording FDI transactions<sup>2</sup>.

Moreover, not only has there been a notable growth in FDI flows as a whole, but also developing and transition countries have gained importance in worldwide investment. Until the beginning of the 21<sup>st</sup> century, most of the FDI movements, both inwards and outwards, were dominated by developed countries and there were a great number of two-way direct investment flows among them. However, that situation has changed and nowadays developing and transition economies play a notable role in the MNCs' decisions to engage in FDI.

Figures 4 and 5 show the percentage of world FDI inflows and outflows by developed, developing and transition economies between 1991 and 2015.

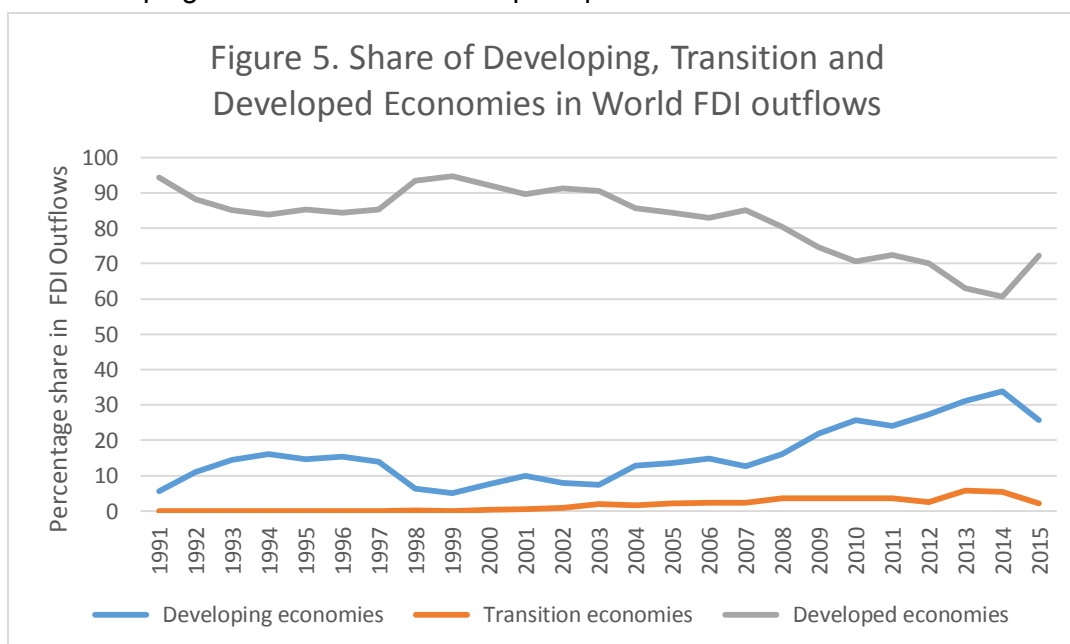


Source: Own elaboration based on UNCTAD database.

<sup>2</sup> See UNCTAD (2016), page 33.

As can be observed in Figure 4, until the beginning of the current century, most FDI inflows were concentrated in developed countries. Since then, however, the gap between developed and developing countries has been declining progressively and considerably, to the point where, in 2014, underdeveloped economies became the highest recipients of FDI for the first time, accounting for about 55% of worldwide inwards, and thus surpassing developed economies, which registered about 40%<sup>3</sup>. Despite this significant rise in FDI flows to developing countries, in 2015 they lost weight in the world with respect to 2014, thereby allowing developed countries to regain their position as the largest receivers of worldwide investment. According to the UNCTAD (2016), this was due to a continuing decrease in commodity prices, especially for crude oil and for metals and minerals, and a surge in cross-border M&As in developed economies. Transition economies have also presented an important rise in FDI inflows. In 1991, their participation in FDI inflows around the world was only a modest share of 0.13%. Subsequently, these economies started to grow at a high rate, reaching its largest percentage of world inflows, 7.18%, in 2008. In 2015, the last year for which data are available, they represented nearly 1.98% of the total inwards.

The top 10 economies which were recipients of FDI inflows in 2015 were United States, Hong Kong (China), China, Ireland, Netherlands, Switzerland, Singapore, Brazil, Canada, and India (UNCTAD 2016). So we can see not only the strong increase in FDI inflows in developing and transition economies, but also that it has positioned some of the developing economies within the top recipient countries of these flows.



Source: Own elaboration based on UNCTAD database.

<sup>3</sup> See UNCTAD (2015).

According to Figure 5, what has occurred for FDI outflows from developing countries is similar to the case of FDI inflows. In this century they have gained importance, thus reducing the difference with developed countries. Nevertheless, as can be observed, unlike FDI inwards, the gap is much higher. In 2015, the last year registered, FDI outwards from developed economies were about 72% of the worldwide FDI outflows, and underdeveloped countries, nearly 26%. Only in the last year, the foreign investment of developing countries experienced a significant drop after three years of uninterrupted growth. According to UNCTAD (2016) this change is due to lower commodity prices and a significant increase in overseas investment by developed countries, favored by the resurgence of European MNEs as major investors, after the decline during four consecutive years in their investments abroad. In addition, transition economies must not be forgotten. They have also experienced a significant growth in FDI outflows, as at the beginning of the 21<sup>th</sup> century, in the year 2000, their share was about 0.27% of the global FDI outwards, and in 2015, this percentage has grown to 2.11%.

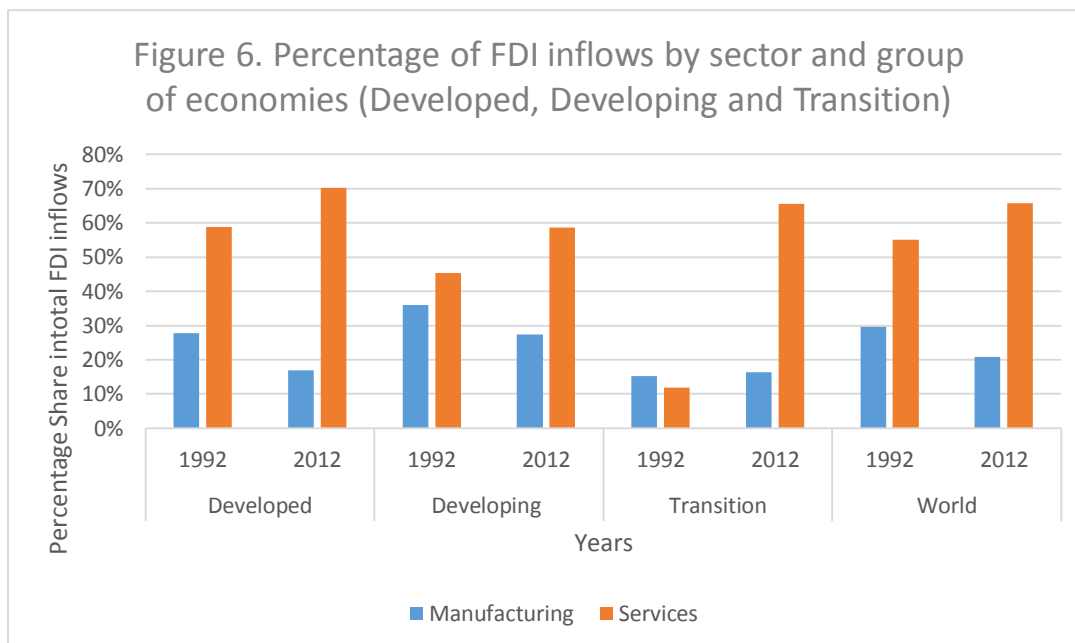
In 2015, the top 10 investor economies abroad were United States, Japan, China, Netherlands, Ireland, Germany, Switzerland, Canada, Hong Kong (China) and Luxembourg (UNCTAD 2016). Then, in contrast to FDI inflows, where four developing and transition countries are among the most important destination countries of FDI (Singapore, Brazil, India and China, including Hong Kong), in FDI outflows the only underdeveloped or transition economy which is among the most important investors is China.

At the same time, two-way direct investment between developed countries has lost its supremacy and other trends are gaining increasingly more weight, such as flows from developed to developing countries, from developing to developed countries, and from developing to other developing countries<sup>4</sup>.

Finally, it is important to highlight that apart from the above changes, there has also been a significant change in the sectoral composition of FDI flows. Figure 6 displays this change.

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<sup>4</sup> See UNCTAD (2015)



Source: Own elaboration based on UNCTAD database.

As Figure 6 shows, in 1992 the manufacturing sector accounted for a 30% share of the total worldwide inflows. However, this percentage has been reduced notably, because in 2012, the last year for which the sectoral division of FDI inflows is available, these inwards flows were about 21% of the total inflows. The opposite pattern has been experienced by the services sector. In 1992 the share of services in FDI inflows accounted for 55% of the total, while in 2012 this share increased to 66%. In addition, it can be observed that these changes have occurred not only at a worldwide level, but also in all categories of countries: developed, developing, and transition economies.

## 2.2. Causes

The increase in the activity of multinationals and, consequently, of FDI flows, as well as the growing participation of developing countries in the world investment landscape, does not have a single cause. These changes are due to the liberalization of the FDI framework, the reduction of transport and communication costs, fostered by the development of new ICTs, and the important activity carried out by Investment Promotion Agencies (IPAs). These factors are involved in the globalization process, as they have led to greater interdependence and interaction between countries around the world, fostering global investment, and changing the landscape of world production.

The United Nations World Investment Report (1998) offers an in-depth review of the liberalization process of the FDI framework<sup>5</sup>. The following paragraphs summarize the main insights affecting current worldwide investment.

Firstly, the relationship between liberalization of FDI and globalization runs both ways, as each of them affects the other. Development in the deregulation of the FDI framework allows MNCs to reach increasingly more regional and global strategies, and to integrate their production structures on a global basis, which at the same time creates incentives to liberalize FDI policies. This mutually reinforcing progress has boosted international production in recent decades and led it to a higher level of integration.

This process of liberalization has been carried out mainly by the tempering or removal of those market distortions that affect the entrance of FDI, the strengthening of certain positive standards of treatment for foreign investors, and higher market supervision to ensure its proper functioning. As a consequence, MNCs have gained greater access to foreign markets, taken advantage of locational attractiveness, such as natural resources, market size and low-cost unskilled labor, and have become more selective and demanding in the choice of locations to place their affiliates.

Moreover, deregulation in worldwide investment has heightened competitiveness among MNCs. For this reason, firms have gone beyond simple integration strategies, towards complex integration, which has enabled firms to look for locations where they can combine their own mobile assets most efficiently with the immobile resources they need to produce goods and services for the markets they want to serve. Firms therefore divide their production processes into various specific activities and segments, which are carried out by affiliates situated in the most suitable location for this particular activity. These processes have created an international intra-firm division of labor and a growing integration of international production networks.

Taking the above-mentioned issues into account, there is no doubt that the process of liberalization has been important in the current panorama of FDI. However, without the decline in transportation and communication costs, such a huge increase in FDI flows, the deep integration among economies and, above all, the emergence of developing countries in worldwide investment would not have been possible.

According to US FDI inflow and outflow data for 2001 and 2010, based on Direct Investment and Multinational Enterprises Data obtained from the US Bureau of Economic Analysis (BEA), about 30% of US FDI outward moves less than 5,000 kilometers and more than 80% occurs over distances of less than 10,000 km. Similar

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<sup>5</sup> See UNCTAD (1998).

facts are observed for US FDI inflows, as a greater share occurs over distances between 5,000 and 10,000 kilometers. In addition, on comparing 2001 data with the data for 2010, it is remarkable that US outward FDI concentrated at less than 5,000 km has fallen from around 30% to around 20%. It can therefore be concluded that the reduction of transportation and communication costs have also allowed the expansion of FDI flows, thus reinforcing the process of reduction of FDI barriers<sup>6</sup>.

Furthermore, the development of new ICTs has also raised the FDI flows and the significance of developing countries in investment decisions. This expansion has been considerable, above all since the beginning of the 21<sup>th</sup> century, when the world witnessed unprecedented technological progress.

According to the UNCTAD (1998), improvements in technology have contributed to the deregulation of a number of important service industries and opening them up to FDI. In addition, this technological development has enhanced the ability of firms to expand production, a fact that, together with the opening of markets, has produced new opportunities for firms to improve their growth and competitive positions. In consequence, the number of MNCs has grown both in developed and in developing countries and, subsequently, the same has occurred with the outward and inward FDI.

Last but not least, IPAs have also played an important role in the FDI landscape. They have carried out promotional activities which have revealed new opportunities and attractiveness in developing countries that MNCs have not been able to find on their own, thus catching the attention of a large number of foreign investors.

Some of these activities are direct mail or telephone campaigns and investment facilitation services (UNCTAD 1998).

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<sup>6</sup> See Alfaro and Chen (2016).

### 3. THE UNDERLYING LITERATURE

There are many complex determinants that make MNCs engage in FDI<sup>7</sup>. The literature has traditionally distinguished between horizontal FDI, motivated by market access, and vertical FDI, motivated by comparative advantage. In horizontal FDI, a firm invests abroad to replicate a subset of its activities or production process in another country to avoid transportation costs, tariffs, and other types of trade costs. Markusen (1984) and Markusen and Venables (1998, 2000) pointed out that horizontal multinationals arise endogenously when there are positive trade costs and low economies of scale. Exports and FDI are substitutes, and firms engage in horizontal FDI when market size is large, scale economies are low, and transportation costs are high. However, there is no evidence that differences in factor endowments play a relevant role in the determination of these flows. Moreover, even in models such as that of Brainard (1993), firms are more likely to engage in horizontal FDI when countries have similar factor endowments.

On the other hand, firms engage in vertical FDI when they fragment their production process across locations, by stages of production. These firms locate the various stages of the value chain in response to cost considerations arising from differences in country factor endowments. According to Helpman (1984) and Helpman and Krugman (1985), multinationals geographically separate different production stages to exploit the varying comparative advantages of countries. In contrast to horizontal FDI, the effect of trade costs should be negative as trade and FDI operate as complements in this case.

Additionally, the literature has more recently suggested the existence of other foreign investment strategies, alternatives to horizontal and vertical FDI, such as complex integration strategies and export platforms.

Complex integration strategies involve MNCs combining both horizontal and vertical FDI, with the aim of reducing the costs of serving an international market. Yeaple (2003a) presented a model focused on complex integration strategies, where MNCs are both horizontally and vertically integrated. Firms from one developed country can invest in another northern developed country, with similar characteristics (horizontal FDI), or in a southern developing country (vertical FDI) or in both simultaneously (complex integration).

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<sup>7</sup> The academic literature on foreign direct investment is vast and the issue has been studied from a large number of scientific fields. See, for example, Markusen (1995), Caves (1996), Blomström and Kokko (1998), Hanson (2001), Lipsey (2002), Barba-Navaretti and Venables (2004), Görg and Greenaway (2004), Blonigen (2005), Harrison and Rodríguez-Clare (2009), Antràs and Yeaple (2014), and Alfaro (2015).

Export-platform FDI occurs when a MNC engages in horizontal FDI in a foreign country with the aim of serving a third country through exports. Ekholm, Forslid and Markusen (2007) developed a model which shows that export-platform FDI arises endogenously in a three-country model with two large, high-cost countries (North) and a small, low-cost country (South), when one of the North countries forms a Free Trade Area with the South country, thereby reducing trade costs between them. Then, the North country which is in the Free Trade Area with the South country produces the good to be sold in the home market, whereas the final product sold in the other northern country is produced in the South and exported.

Although from the point of view of Dunning<sup>8</sup>, the three “legs” of his eclectic paradigm (ownership, location and internalization) are interdependent, the empirical literature has usually explored the role that each of them has in explaining the emergence of MNCs separately. In this work we focus on the location leg.

From this perspective, patterns of FDI have been studied as a function of a country’s characteristics, including the traditional market size (GDP or GDP per capita), factor endowment (skilled and unskilled labor), transportation costs, tariffs, and other factors such as macroeconomic stability, institutional quality, ICT adoption, market potential, distance between source and host country, or agglomeration economies.

GDP (in levels or per capita) is one of the most important location determinants for MNCs’ decisions to invest abroad, as a higher income per capita is related with a larger market size and higher quality market. Brainard (1997) and Carr, Markusen and Markus (2001) studied a positive relationship between affiliates’ sales and the market size, measured in the case of Brainard as the log of per capita income of the host country, and in Carr, Markusen and Markus’s model, as the log of the bilateral sum of real GDP in the parent country and the host country.

More recently, especially from the field of New Economic Geography, it has been emphasized that the relevant market in MNCs’ location choice is not only the market of the host country, but also the market’s magnitude in surrounding countries. MNCs are more likely to locate in regions close to large markets, suggesting that geographical proximity between host and third countries could influence the investment decisions of firms that engage in export-platform FDI (Alfaro and Chen, 2016a). Thus, Head and Mayer (2004) showed that a country’s market potential, measured by the distance-

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<sup>8</sup> See Dunning (1998)



weighted sum of the domestic market and export market sizes, plays a significant role in countries' ability to attract multinational firms<sup>9</sup>.

Proximity between the source and host country is also a significant location factor for MNCs. Depending on the horizontal or vertical orientation of MNCs, distance, as a proxy of transportation costs, is expected to have a positive or negative influence on FDI, respectively (Martí, Alguacil and Orts, 2017:9). However, according to Disdier and Mayer (2004), distance can also capture the transaction cost related to the existence of information asymmetries, cultural differences, and unfamiliarity with the legal framework, so that its effect could be ambiguous. According to Carr, Markusen, and Markus (2001), Baltagi, Egger, and Pfaffermayr (2007), Alfaro and Charlton (2009), and Ramondo, Rodríguez-Clare, and Tintelnot (2015), an increase in the bilateral distance between the source and host country produces a drop in both vertical and horizontal FDI.

Moreover, cost advantages of some countries are an attractive location factor for MNCs that engage in vertical FDI. Firms operating in the manufacturing sector prefer to invest in countries with abundant unskilled labor force, as it is cheaper, in contrast to the services sector, where MNCs prefer to invest in countries with a better endowment of highly skilled labor. Carr, Markusen, and Markus (2001) indicated that the higher the difference of skilled-labor abundance between the parent and the host country is, the more FDI inflows the host country will receive. In addition, Yeaple (2003b) found that US multinational firms from unskilled labor-intensive industries tend to invest in unskilled labor-abundant countries, a result consistent with the hypothesis that countries' factor endowment differences lead to vertical FDI. On the other hand, Alfaro and Charlton (2009) defended that much vertical FDI occurs within high-skill sectors and between developed countries, highlighting the growing importance of intra-firm intermediate trade in multinational activity.

In view of the huge growth of the new ICTs since the beginning of the 21<sup>th</sup> century, it is evident that the adoption of such technologies by the host country is a large determinant for MNCs<sup>10</sup>. According to UNCTAD's data on the business uses of internet and computers across countries, most foreign subsidiaries and multinational companies are

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<sup>9</sup> Other authors that show the relevance of market potential in the location decision of foreign firms include Basile et al. (2008), Crozet et al. (2004), and Pusterla and Resmini (2007), among others.

<sup>10</sup> See Draca, Sadun, and Van Reenen (2007) for an overview of the literature on the impact of information and communication technologies on productivity, and Alfaro and Chen (2016b) for the different mechanisms through which FDI can affect host-country productivity.

located in countries with high business usages of internet and computers. As a consequence, Alfaro and Chen (2015) used their model to examine the relationship between ICT adoption and multinational activity. The results indicate that countries with a greater proportion of businesses using computers attract a significantly larger number of multinational entries, and furthermore a higher usage of computers and internet could moderate the negative role of distance in multinational entry. This suggests that improvements in information technologies could help mitigate the information frictions between the parent firm and its affiliate.

The influence of the number of firms located in the host country on FDI inflows depends on the strength of two opposing forces. Potential investors might be attracted by the presence of firms already existing in a place, as this presence is sending out signals to new investors about the reliability of the host country. Furthermore, the existence of information spillovers arising from agglomeration economies could also increase the attractiveness of a country. However, agglomeration effects might also be capturing the intensity of competition. Accordingly, the increase in the number of firms operating in a market may have a negative impact on the attractiveness of this place through increased competition. Which of these two effects dominates seems to be an empirical question. Alfaro and Chen (2016a) found positive spillovers related to the agglomeration of firms. There are lower transportation costs between input suppliers and final goods producers, labor and capital–good–market externalities produced by the proximity of firms with similar demand for labor and capital goods, and technology diffusion due to lower costs of technology transfer at close distances. In addition, they found important differences among the agglomeration of domestic plants, multinational headquarters, and multinational foreign subsidiaries. Multinational headquarters are, on average, the most agglomerative, and the agglomeration of multinational foreign subsidiaries exhibits a low correlation with the agglomeration of domestic plants, as multinational foreign affiliates are significantly more agglomerative in capital, skilled-labor, and R&D-intensive industries. On the other hand, a rise in the number of companies in a given location could induce them to compete, thus shifting prices down in that place, and therefore reducing incentives to locate there. Crozet, Mayer, and Mucchielli (2002) studied the location determinants of foreign investors in France. The results indicate that foreign firms from the Netherlands and Italy tend to avoid locating near other Dutch and Italian companies, respectively.

As for macroeconomic and financial risk, there is no doubt that it is a real threat for the entry of FDI inwards. According to Demekas et al. (2007) and Zhang (2001), MNCs prefer to invest in countries with higher stability at the macro level, as it produces an increase in the economic security and business opportunities.

Finally, it is important to highlight the role played by corruption in the MNCs' decision to engage in FDI. There are studies which conclude that corruption and institutional instability reduces the incentives of MNCs to localize their production in these countries, and others whose results show the opposite effect. In their respective research, Kinoshita and Campos (2003) and Hyun (2006) showed that less corruption and an efficient institutional system lead to a reduction in investment-related transaction costs and may help to attract FDI. In the opposite way, Lui (1985) stressed that multinational firms might be willing to accept paying bribes in order to speed up the bureaucratic processes to obtain the legal permissions for setting up a foreign plant. In this case, corruption acts as a "helping hand", thereby increasing the profits of multinational firms. Furthermore, Egger and Winner (2005) reviewed the relationship between FDI inwards and corruption using data on 73 developed and less developed countries. They found that corruption adds to the attractiveness for MNCs to place their affiliates.

A similar study to that conducted here was carried out by Martí, Alguacil, and Orts (2017). They investigated how different host country characteristics affect the decision of Spanish MNCs to locate in developing and transition countries, and whether these determinants change when looking at manufacturing or services firms. The main results show that there is a positive relationship between the entrance of Spanish MNCs and market potential, distance (due to the market-seeking FDI and cultural similarities with Latin America countries), GDP per capita, high development index (HDI), agglomeration economies, internet users, road density, and control of corruption. However, a high level of inflation reduces the attractiveness of the host country for the entry decision of Spanish MNCs.

## 4. DATA AND METHODOLOGY

### 4.1. Data and variables

The empirical analysis is based on a dataset which encompasses 22,533 foreign affiliates of 16,167 German parent companies that were located in developing and transition economies between 1990 and 2015. This dataset includes all FDI undertaken by German firms in these economies during the reporting period. It was compiled from the Investment Map database<sup>11</sup>. This source also provides information about location, ownership, and activities of foreign affiliates located in developing and transition countries, all of which allows the dependent variable to be constructed. More specifically, it describes the location choice of each foreign affiliate over 145 possible developing and transition country locations, a value of one being given when foreign affiliates  $i$  located in country  $j$  during the period 1990 to 2015, and zero for all countries other than  $j$ .

Following previous literature, the estimate model includes variables related to the size and quality of the host market, labor market characteristics, geographical proximity, availability of infrastructures, and agglomeration forces. In addition, the role of macroeconomic and institutional stability in the location decision of MNEs is also considered.

In many empirical studies, the market demand in the host country, both size and quality, is measured by income per capita. However, since our analysis also includes another variable from the demand side, market potential, here GDP per capita is expected to capture the negative influence of higher labor costs of the host market on investment. Specifically, we used the logarithm of GDP per capita for 2015 at constant 2010 US dollars, from the World Development Indicators (WDI) database.

Much of the literature related to labor cost uses data on wages instead of income per capita. Nevertheless, the difficulty of having a homogeneous salary cost series for the entire sample has led us to use GDP per capita as a proxy. But its use to represent the relative factor cost in the location choice of FDI could also present additional problems, as this variable may further capture the greater attractiveness of wealthy countries or a significant endowment of skilled labor force.

In order to disentangle these two opposite effects, a variable associated with human capital is added in our analysis. This is the percentage of the population that is 15 years old or more with a tertiary education in the different host countries of the sample. These

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<sup>11</sup> The Investment Map Dataset is compiled by the International Trade Centre and collects yearly FDI statistics for about 200 countries and detailed FDI sectoral and/or country breakdowns.

data are from 2015 and available in the Education Statistics database from the World Bank.

As a measure of the size of the host market we use an indicator of market potential. This concept extends the role played by the host market size in the accessibility of nearby markets. Specifically, in our empirical model we used the logarithm of real market potential. This variable is calculated as:

$$RMKP = GDP_j + \sum \frac{GDP_k}{dist_{jk}}$$

where country  $j$  is the host country and country  $k$  is a neighboring country (that is, a country that shares a common border with the host country), whose influence depends on distance ( $dist$ ). The GDP data are from 2015 and measured at constant 2010 US dollars. They were extracted from the WDI database. The distance is calculated by the bilateral distance in kilometers between the capital of the host country, and the different capitals of the surrounding countries, according to the Centre d'Etudes Prospectives et d'Informations Internationales (CEPII) database (2015).

Moreover, the importance of agglomeration effects must not be forgotten. The clustering effects, usually measured by the number of firms active in the host market, could be a factor which can attract or prevent the entry of FDI in a host country, as has been mentioned in the previous point. The existence of positive information spillovers arising from agglomeration economies could increase the attractiveness of a country to locate a subsidiary. However, the increase in the number of firms operating in a market might also be capturing the intensity of competition and, accordingly, may have a negative impact on the attractiveness of this place.

According to Pusterla and Resmini (2007), the absolute measure of the total number of foreign affiliates in a host market might not be taking into account other relevant effects related to agglomeration patterns. Thus, following these authors, we employed Hoover's location index as a relative measure of agglomeration. Additionally, in order to capture the different impacts of the concentration of German-owned and other foreign-owned firms on the attraction of FDI, these indexes have been elaborated separately for German and non-German affiliates, respectively. For the German index, only the number of German firms which are in the host countries has been borne in mind. Conversely, the non-German subsidiaries' index has been calculated through the number of foreign affiliates minus the number of German subsidiaries which are in the destination countries. The number of companies, both German-owned and foreign-owned, are found in the Investment Map Database. Hoover's location index is defined as:

$$H_h^j(w) = \frac{N_h^j(w) / \sum_j N_h^j(w)}{\sum_h N_h^j(w) / \sum_h \sum_j N_h^j(w)}$$

where  $N_h^j(w)$  is the total number of foreign affiliates in sector  $h$  and country  $j$ , and  $w$  is equal to  $g$  for German-owned firms and  $f$  for foreign-owned firms. Accordingly,  $H_h^j(g)$  and  $H_h^j(f)$  are greater than one when a country  $j$  has a concentration of German- or foreign-owned affiliates, respectively, in sector  $h$  that is higher than other countries, while these indexes are equal to zero when foreign affiliates in sector  $h$  are completely dispersed across countries.

In addition, the geographical distance between Germany and the possible destination countries is also considered. This variable is traditionally associated with transportation cost, having a positive or negative effect on the entry of inward FDI in a host country, depending on the foreign investment strategy, vertical or horizontal FDI, respectively. Nevertheless, it also collects the transaction costs which arise from cultural differences and unfamiliarity with the legal framework (Disdier and Mayer, 2004). In this model, we used the logarithm of bilateral distance in kilometers between the German capital, Berlin, and the different capitals of the possible destinations, following the CEPII database (2015).

Recent works have also identified the availability and quality of different kinds of infrastructures as an important factor in the attraction of MNCs' activity, especially for developing and transition economies. Empirical studies, such as Alfaro and Chen (2015), highlight that countries with a greater proportion of businesses using computers attract a significantly larger number of multinational entries. In this work, we used the logarithm of the number of internet users per 100 people in each developing and transition economy where there are German affiliates, according to WDI data (2015).

Additionally, it is also interesting to study the impact of macroeconomic stability on the location choice. High inflation leads to increased uncertainty in the economy and, consequently, it produces an inappropriate climate for doing business. In this research, macroeconomic instability is approximated by the logarithm of the annual percentage variation in the consumer price index of 2015, reported in the WDI database.

Finally, we used a corruption index variable as a proxy for the quality of institutions in the host country. Better institutions are usually assumed to improve the business environment and encourage firms to locate in the country under consideration; however,

as we have already mentioned, the empirical evidence does not always agree with this statement. With the aim of controlling for this effect we have included the Bayesian Corruption Indicator. It takes values between 0 and 100, an increase in the scale indicating a higher level of corruption. The data are from 2013 and taken from the Quality of Government Institute (QOG) database.

#### 4.2. Methodology

In this work we estimate the determinants of the location choice of German subsidiaries, and whether these determinants change when looking at manufacturing (m) or services (s) firms, by means of a logit model. Consistent with the Random Utility Maximization framework, these models assume that each investor  $i$  ( $i \in \Omega_h$ , where  $h = m, s$ ) that faces a finite set of mutually exclusive locations selects the country  $j$  that leads to the most profit (i.e.,  $\pi_{ij} > \pi_{il} \forall l \neq j$  and  $l = 1, \dots, L$ ). The expected profit of firm  $i$  from each location  $j$  consists of two components, the deterministic part,  $V_{ij}$ , which depends on the observed attributes of each location choice  $j$ ,  $X_{ij}$ , and the unobservable part, which is captured by a stochastic term,  $\varepsilon_{ij}$  (thus,  $\pi_{ij} = V_{ij} + \varepsilon_{ij} = \beta_h' X_{ij} + \varepsilon_{ij}$ ). Given that  $\varepsilon_{ij}$  is unknown, the final choice is predicted in terms of probability. More specifically, the probability of firm  $i$  choosing location  $j$  can be described as:

$$P_{ij} = P(\pi_{ij} > \pi_{il}) \forall l \neq j \quad (l = 1, \dots, L)$$

The traditional conditional logit (CL) model assumes that it is independently and identically distributed (iid), with type I extreme value distribution (McFadden, 1974).

The function which shows the probability of German MNC to engage in FDI in a certain country depends on the location determinants of that host country.

$$P(Y = 1 / X) = \phi(\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_k X_k)$$

where  $Y$  is equal to 1 if the firm decides to offshore its production in that country,  $\beta_k$  is the effect of the location determinant  $X_k$  in the firm's decision to engage in FDI, and  $\phi$  represents the function of the accumulative distribution of a normal typified distribution.

## 5. ESTIMATION RESULTS

The results can be observed in Table 1.

**Table 1. Results**

Variables	Manufacturing		Services	
	(1)	(2)	(3)	(4)
<b>Log market potential</b>	0.966*** (0.012)	0.964*** (0.018)	0.686*** (0.006)	0.655*** (0.012)
<b>H. Index Germany</b>	2.014*** (0.048)	1.821*** (0.061)	-1.327*** (0.0354)	-1.035*** (0.052)
<b>H. Index Foreign</b>	-1.143*** (0.045)	-1.046*** (0.074)	1.178*** (0.06)	0.918*** (0.082)
<b>Log GDP per capita</b>	-0.144*** (0.005)	-0.166*** (0.007)	-0.065*** (0.003)	-0.103*** (0.007)
<b>Log distance</b>	-0.291*** (0.014)	-0.291*** (0.021)	-0.758*** (0.011)	-0.055*** (0.016)
<b>Human capital</b>		0.006*** (0.001)		0.018*** (0.002)
<b>ICT infrastructures</b>		0.147*** (0.036)		0.313*** (0.038)
<b>Corruption</b>		0.047*** (0.003)		0.019*** (0.002)
<b>Inflation</b>		-0.114*** (0.019)		-0.053*** (0.012)
<b>Log-likelihood</b>	-23,676.87	-18,223.003	-44,151.023	-25,729.369
<b>Number of observations</b>	684,324	410,534	1,502,205	588,522
<b>Pseudo R<sup>2</sup></b>	0.3718	0.4087	0.2198	0.2483

Note: \*\*\*, \*\*, \* denote significance level at 1%, 5% and 10%, respectively. Robust standard errors are in parenthesis.

The first two columns of the table, (1) and (2) correspond to the manufacturing sector, and columns (3) and (4) to the services sector. Columns (1) and (3) are the baseline model, where the probability of a German MNC engaging in FDI depends only on market potential, German and foreign agglomeration, distance between Germany and the host country, and GDP per capita. On the other hand, in order to control for the role of other



host characteristics in the location choice, in columns (2) and (4) the model is expanded to consider infrastructures, quality of institutions, macroeconomic stability, and human capital, adding the number of internet users, the corruption indicator, and the rate of inflation through the consumer prices index, and the percentage of population with a tertiary education.

The pseudo  $R^2$  employs the verisimilitude function in order to calculate the goodness of fit. As can be observed in the results in the table, for the manufacturing sectors it is 0.3718 in the baseline model and 0.4087 in the extended model. These values are high enough for a conditional logit function, indicating that our models are quite precise to predict the effect of location determinants in the decisions of German MNCs in the secondary sector. For the services sector, they are lower, 0.2198 in the baseline model and 0.2483 in the extended model. In any case, neither of them are too low to give us incorrect information.

Similar to previous studies, market potential is a key determinant of the MNCs' location choice. It is seen that its coefficient is positive and statistically significant at the 1% significance level, for the manufacturing and services sector, as well as for the baseline model and the expanded model. So, German MNCs take into account not only the size of the host market country, but also that of the surrounding markets, in order to engage in more complex FDI strategies.

Nevertheless, the coefficient of the GDP per capita is negative and relevant, showing that it is a factor which has a negative effect on the location decisions of German MNCs. This result is expected, as in this work it is capturing the labor cost. Consequently, an increase in the GDP per capita is related to higher labor cost for the German MNCs.

In the same way, our results indicate that the distance between the country of origin and the recipient region is a weakness for transnational companies to engage in FDI. It is probably due to the fact that a larger distance to the host country is equivalent to more cultural and legal differences with respect to the investor country.

Furthermore, the human capital proxied as the percentage of population with a tertiary education is an attractive factor for German MNCs to invest in a foreign country. As can be observed in columns (2) and (4), the coefficient of this variable is positive and statistically significant at the 1% level. Its effect was expected, because the population with a tertiary education is a signal of more skilled workers. In this way, a company can take on workers with greater abilities and hence increase its productivity.

Location choice also seems to be positively correlated with the endowment of some specific infrastructures related with technological and communication progress, as shown by the significant coefficient of internet users in the manufacturing and the services columns. This result is consistent with the underlying literature, as countries with better ICT endowments can help firms to be more efficient in their production processes.

An interesting result is obtained with the corruption variable. Our table shows that it is positive and statistically significant. This result, although surprising, is similar to that obtained by other researchers, and shows the possibility that multinational firms might be willing to accept paying bribes in order to get preferential treatment by governments. It is therefore deduced that German multinationals prefer corrupt countries to offshore their production. In this way, they can take advantage of institutional instability to avoid the legal framework, which could slow down the processes involved in their undertakings.

Regarding inflation, our results agree with other studies conducted around the world on this issue. It is negative and highly significant. To the extent that high inflation is capturing macroeconomic instability, this result implies that MNCs prefer countries with stable macroeconomic environments to locate their affiliates.

Finally, as documented by different studies, concentration of multinational firms in a place or country can have a positive or a negative effect on the new MNC's decision to engage in FDI in that place or country. In our case, the effect of agglomeration externalities, although always significant, differs between the two sectors and with the nationality of the competitors. In manufacturing, the positive spillovers of the agglomeration of other German MNCs dominate in the attraction of FDI. However, the competition effect associated with agglomeration of foreign MNCs in the host country seems to deter the entry of German MNCs. The opposite result is obtained for the services sector, where German companies do not want to stay close to others from the same country, but they find positive synergies in clustering with foreign firms.

This fact is quite interesting and raises a line of research that can be attractive, since companies of the same nationality (German) but from different sectors of activity seem to react in a diametrically opposed way to the presence of other MNCs depending on their nationality. It should also be mentioned that the correlation between the two agglomeration indexes is quite high (0.597), which could also affect this result.

## 6. CONCLUSIONS

The main objective of this research has been to review how different host country determinants affect the location decision of German MNCs in developing and transition economies. More specifically, the analysis has sought to determine whether there is some change in the location factors of multinational firms depending on the sector where they carry out their activity: manufacturing or services. The motives that lead them to invest abroad and the different composition of FDI define the importance of local factors that make recipient countries more attractive for transnational investments. Furthermore, a better understanding of these factors can help developing and transition countries to catch the attention of MNCs in order to attract their activity, and maintain their important role in worldwide foreign investment. For this work, the econometric analysis was performed through a conditional logit model.

The results indicate that market potential is a determining factor in the multinationals' decisions regarding foreign investment, as not only the market size of the host country but also that of the surrounding markets are important.

The percentages of the population with a tertiary education and internet users have an identical effect, because these two variables mean the existence of human capital and of appropriate infrastructures in the recipient country, and both factors could improve the production processes of the companies.

Additionally, German firms prefer to place their subsidiaries in countries with low levels of institutional quality, probably with the aim of avoiding tedious bureaucratic processes that could slow down the internationalization and expansion of their production.

In contrast, GDP per capita, as it could be synonymous of high relative labor costs, is a negative location determinant. The same effect has been collected for inflation, because firms avoid staying in countries with high macroeconomic instability and financial risk. Furthermore, cultural and legal framework differences have a negative effect on the location of German firms, as can be deduced from distance.

Finally, the outcomes obtained in the agglomeration indexes are unusual and interesting. The high competitiveness of German manufacturing firms prevents them from placing near other foreign companies, but they find positive spillovers from clusters of German firms. Opposite results have been obtained for the services sector. Dispersion forces stand out in the concentration of German firms, but agglomerative effects arise from other foreign firms.

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## APPENDIX

**Table A.1. Summary of the variables**

<b>Variables</b>	<b>Definition</b>	<b>Source</b>
<b>Log market potential</b>	Value added of the host country <i>j</i> and adds the value added of all surrounding countries weighted by the distance between major cities in the host and surrounding countries. It is taken in logarithms.	Own elaboration (value found in WDI database, 2015).
<b>Log GDP per capita</b>	Logarithm of GDP per capita in the host country <i>j</i> .	World development indicators database, 2015.
<b>Log distance</b>	Logarithm of bilateral distance between the main cities in home and host countries (km).	Centre d'Etudes Prospectives et d'Informations Internationales (CEPII, 2015).
<b>German agglomeration</b>	Hoover's location index for Spanish firms in the host country <i>j</i> over the period 1990-2010.	Own elaboration based on Investment Map database (ITC, 2015).
<b>Foreign agglomeration</b>	Hoover's location index for foreign firms in the host country <i>j</i> over the period 1990-2010.	Own elaboration based on Investment Map database (ITC, 2015).
<b>Inflation</b>	Consumer price index in the host country <i>j</i> .	World Development Indicators (World Bank database, 2015).
<b>Corruption</b>	Level of corruption in the host country <i>j</i> , measured through the Bayesian corruption indicator.	Quality of Government database (2013).
<b>ICT infrastructures</b>	Logarithm of total number of internet users in the host country <i>j</i> (per 100 people).	World Development Indicators (World Bank database, 2015).
<b>Human capital</b>	Percentage of population with a tertiary education.	Education Statistics from World Bank (2015).



**Table A.2. Correlation matrix**

<b>Variables</b>	<b>Log market potential</b>	<b>H. index Germany</b>	<b>H. index foreign</b>	<b>Log GDP per capita</b>	<b>Log distance</b>	<b>Human capital</b>	<b>ICT infrastruct.</b>	<b>Corruption</b>	<b>Inflation</b>
<b>Log market Potential</b>	1.000								
<b>H. index Germany</b>	0.278	1.000							
<b>H. index foreign</b>	0.361	0.597	1.000						
<b>Log GDP per capita</b>	0.228	0.074	0.102	1.000					
<b>Log distance</b>	0.05	0.022	0.150	0.216	1.000				
<b>Human capital</b>	0.302	0.307	0.162	-0.086	-0.214	1.000			
<b>ICT infrastructures</b>	0.256	-0.039	-0.020	0.014	-0.281	0.329	1.000		
<b>Corruption</b>	0.078	0.094	0.191	-0.038	-0.094	0.008	-0.356	1.000	
<b>Inflation</b>	0.250	0.120	0.142	-0.178	0.024	0.026	-0.091	0.224	1.000