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# Foreign Direct Investment, Technology and Economic Growth: What the Data Say

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## Abstract

In this article we study the relationship between foreign direct investment (FDI) and economic growth. We classify FDI data by technology to a level of detail which is novel in the literature. We do this by following the criteria laid down by the Organization for Economic Cooperation and Development (OECD) for differentiating sectors by technological content and collating FDI data from multiple sources accordingly. Then we probe the existence of a relationship between FDI and growth by means of choropleth maps and scatterplots. Our findings confirm that FDI and growth are positively related, however we find that, at least in the secondary sector, this positive relationship is strongest when FDI carries a high technological content, while it becomes weaker for less technological FDI types and it even turns negative when the FDI involved is of the lowest technological type. These findings may be used by policy makers in FDI-receiving countries when deciding which type of FDI they should target.

**JEL Codes:** F21, F43, O14

**Keywords:** Foreign direct investment, economic growth, manufacturing and service industries, technology.

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# Uluslararası Doğrudan Yatırım, Teknoloji ve Ekonomik Büyüme: Veriler Ne Söylüyor?


## Öz

Bu makalede, uluslararası doğrudan yatırım (UDY) ile ekonomik büyüme arasındaki ilişkiyi inceliyoruz. Literatürde yeni olan UDY verilerini belli bir ayrıntı düzeyinde teknolojiye göre sınıflandırıyoruz. Bunu, teknolojik içerik açısından sektörleri farklılaştırmak için Ekonomik İşbirliği ve Kalkınma Teşkilatı (OECD) tarafından belirlenen kriterleri takip ederek ve buna göre birden çok kaynaktan gelen UDY verilerini derleyerek yapıyoruz. Ardından, *choropleth* haritaları ve dağılım grafikleri aracılığıyla UDY ile büyüme arasındaki ilişkinin varlığını araştırıyoruz. Bulgularımız UDY ve büyümenin pozitif ilişkili olduğunu doğrulamaktadır, ancak en azından ikincil sektörde, bu pozitif ilişkinin UDY yüksek teknolojik içerik taşıdığında en güçlü olduğunu, daha az teknolojik UDY türleri için daha zayıf hale geldiğini ve hatta UDY en düşük teknolojik türde olduğunda negatife döndüğünü görüyoruz. Bu bulgular, UDY alan ülkelerdeki politika yapıcılar tarafından hangi tür UDY'yi hedeflemeleri gerektiğine karar verirken kullanılabilir.



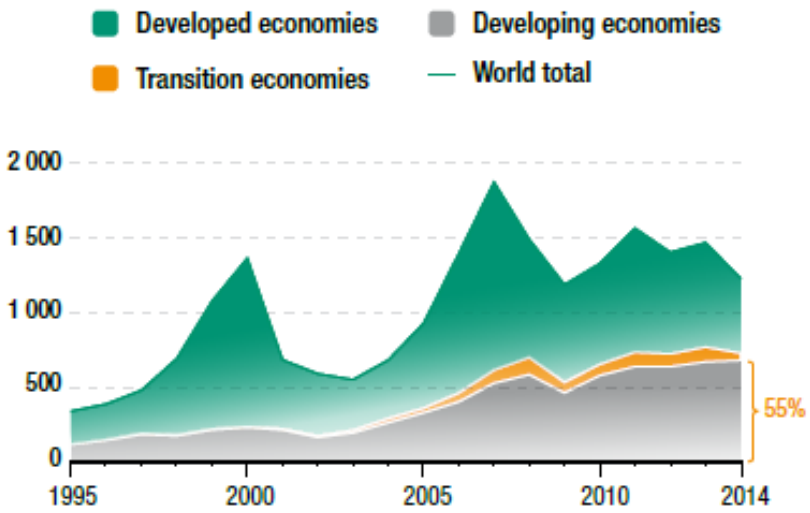
**JEL Kodları:** F21, F43, O14

**Anahtar Kelimeler:** Doğrudan yabancı yatırım, ekonomik büyüme, imalat ve hizmet sektörleri, teknoloji.

# 1. Introduction

In recent decades, as multinational firms looked for different ways of expanding their business beyond their national borders, there has been a surge in the flows of foreign direct investment (FDI) to a number of host countries, as can be seen in Figure 1.

**Figure 1: FDI Inflows, Global and By Group of Economies, 1995-2014**




Source: UNCTAD, World Investment Report 2015.

This increase in FDI flows triggered a very large number of studies which were aimed at understanding the relationship between FDI and the economic growth of host countries. In particular, there was a strong interest in understanding whether the FDI flows were beneficial for the economy of the recipient countries. However, initial efforts in this direction were hampered by the lack of satisfactory data regarding FDI for sufficiently long time intervals. Therefore, in the early stages of the surge in FDI, accessible data would concern FDI aggregates only. Hence, initially, scholars would only be able to study the relationship between FDI aggregates and the economy of the host countries. Over time, as data became more plentiful, detailed and covering longer time spans, it became possible to study the relationship between FDI and growth along dimensions that had hitherto remained largely unknown. In this respect, recently it has become possible to access FDI data classified along several dimensions, such as sector of activity, country of origin, etc. Researchers have naturally started taking advantage of this increase in data availability to investigate whether the effect on the economy of the host country may change depending on the type of FDI being considered. The present study belongs in this category. as it attempts to probe whether the existence or

not of a relationship between different FDI types and the economic performance of the host country, as measured by its economic growth rate in per capita terms, depends on the technology embedded into that particular FDI type. To do this, we compile FDI data for 2010 and compare them against the growth performance of the recipient countries for the 5-year interval between 2011 and 2015. We then try to capture the existence of a positive association between FDI and growth by employing two different visual tools: choropleth maps to gauge the geographical distribution of FDI and to map it against economic growth rates. Scatterplot graphs to gain more solid evidence about the alleged relationship between FDI and growth. The year 2010 is chosen to provide the most recent snapshot of FDI activity at the desired level of technological detail. This is the most serious constraint with respect to availability of data. Admittedly the choice of 2010 is somewhat arbitrary. However, the study, as we shall see, can still deliver valuable qualitative insight given that the controversy surrounding the relationship between FDI and growth has not been completely cleared even after employing very sophisticated statistical techniques.

After a literature review in Section 2, the objectives of this study and the methodology chosen are described in Section 3. Section 4 contains important information concerning selection of variables, sampling and data, while Section 5 contains the main findings. Finally, Section 6 concludes and provides some guidelines for future work.

## 2. Literature Review

Probably the earliest attempt at studying the effect of different FDI types on economic growth was performed by Alfaro (2003). Alfaro (2003) employed cross-country data between 1981 and 1999, covering 47 countries in total. The study used a data set from OECD which breaks investment down by sector and data from UNCTAD World Investment Directory (WID) to probe the impact on economic growth of FDI flowing into the primary, secondary and services sectors respectively. The study found that the effect of FDI on economic growth was sector-dependent, with FDI into primary sector having a negative impact on growth, the impact of FDI in manufacturing was positive, while the effect of FDI in the services sector was ambiguous. Alfaro and Charlton (2007) later extended the above work by not only differentiating FDI by sector, but also along a number of additional dimensions including industry characteristics, such as average skill intensity and reliance on external capital, and the recipient country's preferences. To do so, they used industry level data set covering 29 countries over the period 1985 to 2000. Although the authors cautioned that their results are preliminary, mainly due to the scarcity of data, it is worth mentioning that the FDI in industries with higher skills requirements and in industries more reliant on external capital is found to be associated with higher economic growth.

In Beudelsdijk et al. (2008), FDI is classified as horizontal (market seeking) FDI and vertical (efficiency seeking) FDI. The evidence comes from a panel of 44 host countries for the period between 1983 and 2003. In this case, the authors find that both horizontal and vertical FDI have positive and significant growth effects in developed countries, while the effect of horizontal FDI is found to be about 50% larger than that of vertical FDI. However, the paper did not find any statistically significant impact of FDI, whether horizontal or vertical, on economic growth in developing countries.

A relatively more recent paper (Wang, 2009) decomposes FDI into manufacturing and non-manufacturing FDI and investigates their impact on economic growth of host countries for 12 Asian economies over the period 1987-1997. The empirical results show that manufacturing FDI has a positive and significant impact on economic growth of the recipient country, whereas the effect of FDI inflows in non-manufacturing sectors is ambiguous.

Earlier contributions had brought to the fore the FDI-technology-growth connections but stopped short of classifying FDI by technological content as we do here because of unavailability of data at the time. Prominent among these are Borenzstein et al. (1998) and De Mello (1997).

# 3. Study Objective, Methodology and Challenges

Our aim is to investigate the existence of a positive association between the geographical distribution of FDI/GDP ratios and the subsequent economic performance of the beneficiary countries, as measured by the growth rate of economic output (GDP per person). In addition, we would like to take advantage of our classification of FDI by technological content to investigate whether the above mentioned association (if there is one) depends on which type of FDI is considered. Since economic theory suggests that FDI may work as a vehicle for technology transfers[1], we distinguish FDI by technological content as discussed in Section 4 below. We then check if there is a positive association between different FDI types with respect to technology and growth, moving from higher to lower level of technology. Towards this goal, first we display the distribution of FDI at different levels of detail by means of choropleth maps. As these maps will illustrate, the geographical distribution of FDI depends on technological content. As a point of departure, we first look at the relationship between total aggregate FDI and economic growth which we use as a benchmark case. Then we look at whether FDI in the primary (which include agriculture and mining), secondary and services sectors are themselves associated positively with growth. Finally, we employ the six different FDI types by level of technology: four in the secondary sector (high tech, medium-high

[1] The already mentioned Borensztein et al. (1998) and De Mello, L. (1997) are two important examples in this respect.

tech, medium-low tech and low tech) and two in the services sector (high tech and low tech).

The choropleth maps should help identify those countries where FDI inflows were brisk, at different levels of detail. The maps refer to 2010, the latest year that ensures the broadest possible coverage with respect to the FDI with high technological content in the secondary sector. As already pointed out above, this type of FDI is the most interesting for the purposes of this study but at the same time it is the type for which finding relevant data is hardest. We compare and contrast the FDI maps with a choropleth map showing the growth performance of countries around the world for the period 2011 – 2015. The choice of this 5-year interval subsequent to 2010 for the comparison should shed some initial light on whether it is possible or not to speak about an association between FDI inflows at one point in time and the subsequent growth performance of the receiving country. The important caveat here is that choice of the reference year, 2010, is somewhat arbitrary. In its defense, I shall cite the need to obtain the most recent available picture, compatibly with availability of data or lack thereof.

The other tool of analysis employed to reinforce the understanding gained by means of the choropleth maps is scatterplot graphs. In these graphs, we plot GDP per capita growth rates against all types of FDI/GDP ratios for which choropleth maps where produced. For the sake of comparison, the time period involved is consistent with that of the choropleth maps: FDI/GDP ratios refer to 2010, while per capita GDP growth rates refer to the subsequent 5-year interval going from 2011 to 2015. As already mentioned in the introduction, although the choice of 2010 for FDI/GDP ratios may seem arbitrary, it is made to provide the most recent snapshot of FDI activity for all technology types, in full awareness that any longer time interval would have shrunk the sample size beyond an acceptable level. We argue that the insight delivered by adopting this strategy, as opposed to renouncing because of insufficient data, makes the study valuable. This view is also supported by the fact that past literature has so far failed to reach a consensus on the FDI-growth nexus, despite the use of increasingly sophisticated statistical techniques.

## 4. FDI Classification, Sample Selection and Data Sources

According to economic theory, one channel through which FDI may influence the economy of the receiving country would be by acting as a vehicle for technology transfer from the country of origin to the country of destination of the investment flow. Somewhat surprisingly, so far not much attention has been devoted at testing whether technology plays an important role in shaping the type of impact that FDI has on the economy of the host country. This study wants to fill this gap by investigating the existence and the magnitude of any peculiar role technology may play. To this end, we

collected data for 51 countries (both developed and developing), spanning the period between 1989 and 2015. It is important to note that the sample of 51 countries used in this study includes five main regions: 7 countries are from East Asia and the Pacific, 27 countries are from Europe and Central Asia, 14 are from North and Latin America, 1 (Tunisia) is from the Middle East and Africa and 2 (India and Pakistan) are from South Asia. The most notable absences from this sample, for lack of detailed FDI data, are China and Russia. The full list of countries is given in Table 1.

The WID classifies FDI data according to the U.N. International Standard Classification (ISIC) Revision 3. This is a very detailed and accurate classification of economic activities, which makes the task of grouping sectors by technological content far easier. On the basis of this classification, we follow the criteria laid down by the OECD for differentiating sectors by technological content illustrated in Table 2 below and accordingly used four different groups in the secondary sector. As for the services sector, we split the sector into two groups: high tech and low tech. The detail concerning the different FDI types used in this study can be found in Table 2.

**Table 1: List of Countries Used in This Study**

| | | |
|---|---|---|
| 1. Argentina | 18. France | 35. Pakistan |
| 2. Armenia | 19. Germany | 36. Paraguay |
| 3. Australia | 20. Greece | 37. Peru |
| 4. Austria | 21. Guyana | 38. Poland |
| 5. Bolivia | 22. Hong Kong | 39. Singapore |
| 6. Brazil | 23. Hungary | 40. Slovak Republic |
| 7. Bulgaria | 24. India | 41. Slovenia |
| 8. Canada | 25. Indonesia | 42. Spain |
| 9. Costa Rica | 26. Ireland | 43. Sweden |
| 10. Croatia | 27. Italy | 44. Switzerland |
| 11. Cyprus | 28. Japan | 45. Thailand |
| 12. Czech Republic | 29. Korea | 46. Trinidad and Tobago |
| 13. Denmark | 30. Latvia | 47. Tunisia |
| 14. Dominican Republic | 31. Lithuania | 48. Turkey |
| 15. El Salvador | 32. Mexico | 49. United Kingdom |
| 16. Estonia | 33. Netherlands | 50. United States |
| 17. Finland | 34. Norway | 51. Uruguay |

**Table 2: FDI Decomposition by Sector and by Technology**

| | | |
|---|---|---|
| Secondary | High Tech | • Aircraft and Spacecraft<br>• Pharmaceuticals<br>• Office, accounting and computing machinery<br>• Radio, TV and communication equipment<br>• Medical, precision and optical instruments |
| | Medium High Tech | • Electrical machinery and apparatus, n.e.c.<br>• Motor vehicles, trailers and semi-trailers<br>• Chemicals excluding pharmaceuticals<br>• Railroad equipment and transport equipment, n.e.c.<br>• Machinery and equipment, n.e.c. |
| | Medium Low Tech | • Building and repairing of ships and boats<br>• Rubber and plastics products<br>• Coke, refined petroleum products and nuclear fuel<br>• Other non-metallic mineral products<br>• Basic metals and fabricated metal products |
| | Low Tech | • Manufacturing, n.e.c.; Recycling<br>• Wood, pulp, paper, paper products, printing and publishing<br>• Food products, beverages and tobacco<br>• Textiles, textile products, leather and footwear |
| Services | High Tech | • Post and Telecommunications<br>• Financial Intermediation<br>• Renting and Business Activities<br>• Education, Health and Social Work |
| | Low Tech | • Services n.e.c. |

FDI data were compiled, whenever available, from the central bank of the country concerned. In all other cases, data were compiled from international FDI data repositories such as the United Nations Conference on Trade and Development (UNCTAD) and OECD. Data on per capita GDP growth rates is obtained from the World Bank World Development Indicators. The annual percentage growth rate of GDP per capita is based on constant local currency. GDP Aggregates for the FDI/GDP ratios and the GDP growth rates are based on constant 2010 U.S. dollars.

# 5. Main Results

The first map, below, shows the distribution of total FDI/GDP ratio (Figure 2).

**Figure 2: Worldwide Distribution of Total FDI/GDP Ratio, 2010**


Source: Data compiled by the author, based on several primary sources.[2]

As can be seen, in 2010 Russia, Turkey, Ireland Estonia and Slovenia were the countries which were able to attract the largest inflows of FDI relative to their GDP with ratios all above 5%. At the other end of the range, with negative FDI/GDP ratios (meaning a net FDI outflow) we find a number of countries, including China, Japan, much of Western Europe and Brazil.

The next three maps, in Figures 3a, 3b and 3c, look at the distribution across countries with a sector-wise focus. Accordingly, the first map looks at the primary sector, the second looks at the secondary sector and the third map features the services sector.

[2] These primary sources include, whenever available, data from the central bank of the country concerned or, if not, international FDI data repositories such as the United Nations Conference on Trade and Development (UNCTAD) and OECD.

**Figure 3a: Worldwide Distribution of Primary Sector FDI/GDP Ratio, 2010**


**Figure 3b: Worldwide Distribution of Secondary Sector FDI/GDP Ratio, 2010**


**Figure 3c: Worldwide Distribution of Services Sector FDI/GDP Ratio, 2010**

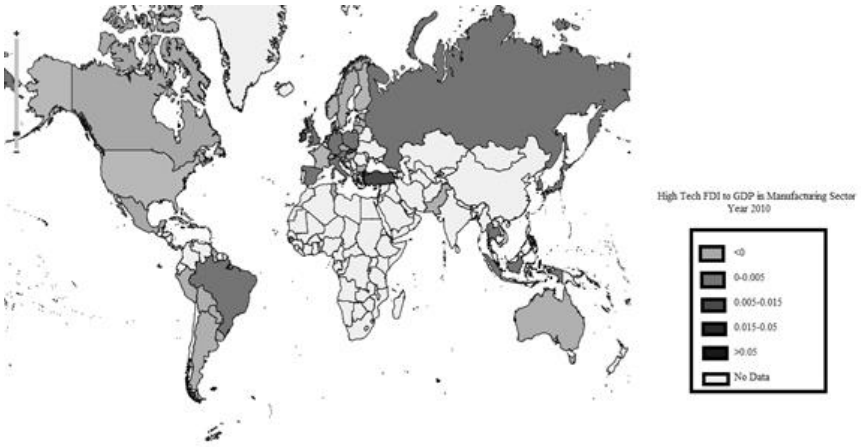

Source: Data compiled by the author, based on several primary sources.

In this case, remarkably, the association between the two is negative and the slope of the line of best fit is -0.37. This finding points to the very important fact that not all FDI types may be growth-fostering and the technological content of FDI is of crucial importance.

Turkey is again prominent as the highest recipient, both in the secondary sector, along with the Netherlands, and the services sector, along with Ireland, Estonia and Slovenia. In the primary sector, however, China and Peru' lead the field, while Turkey slips down the rankings to boast ratios similar to those of the U.S., much of Western Europe and South East Asia.

Finally, we present a series of maps which show the distribution of FDI in 2010 classified by technological content. These maps are based on data gathered specifically for this study and as such contain novel information. The first four maps concern the secondary sector and FDI is divided into four categories: high tech, medium-high tech, medium low-tech and low tech. The remaining two maps concern high tech and low tech FDI in the services sector.

**Figure 4: Worldwide Distribution of High Tech Secondary FDI/GDP Ratio, 2010**




Source: Data compiled by the author, based on several primary sources.

Turkey, Ireland and Slovakia are the countries that boast the highest ratios of high tech secondary FDI to GDP, with values in the range 0.5% to 1.5%. By contrast, many countries feature negative ratios, indicating net FDI outflows with respect to flows with high technological content. Prominent among these countries, are the U.S., Canada, most of Latin America, Australia, France and the Scandinavian countries.

**Figure 5: Worldwide Distribution of Medium-High Tech Secondary FDI/GDP Ratio, 2010**


Source: Data compiled by the author, based on several primary sources.

Turkey and Finland are the countries that boast the highest ratios in the case of medium-high tech secondary FDI, with values above 5%. At the other end of the range, the number of countries with negative ratios is now lower and it includes Italy and Indonesia.

**Figure 6: Worldwide Distribution of Medium-Low Tech Secondary FDI/GDP Ratio, 2010**


Source: Data compiled by the author, based on several primary sources.

With respect to medium-low tech secondary FDI, Turkey is the only country which can boast a ratio to GDP greater than 5%. By contrast, Sweden, Finland, India, Peru', Bolivia and Paraguay saw net FDI outflows of this type in 2010.

**Figure 7: Worldwide Distribution of Low Tech Secondary FDI/GDP Ratio, 2010**


Source: Data compiled by the author, based on several primary sources.

In the case of low tech secondary FDI, Turkey and the United Kingdom are characterized by ratios in the range 1.5% to 5%, while a few countries in Eastern Europe, chiefly among which Poland, boast negative ratios.

In the services sector, FDI of the high tech type, weighed by GDP, flows most abundantly into Turkey, Ireland Slovenia, Austria and Estonia (all with ratios above 5%). The countries of Mediterranean and Eastern Europe, along with Thailand witness negative FDI/GDP ratios of this type.

**Figure 8: Worldwide Distribution of High Tech Services FDI/GDP Ratio, 2010**


Source: Data compiled by the author, based on several primary sources.

Finally, with respect to low tech FDI in the services sector, Turkey and Slovenia are again the best performers (above 5%) while only few countries in Eastern Europe boast negative ratios.

**Figure 9: Worldwide Distribution of Low Tech Services FDI/GDP Ratio, 2010**


Source: Data compiled by the author, based on several primary sources.

Our interest in probing the existence of a positive relationship between FDI of a certain type and the economic growth of the receiving country is both scientific and

aimed at helping policy makers. To gain a better understanding of this point, suppose for example that we find that high-tech FDI in the secondary sector and the economic growth of the recipient economy are positively associated. A number of statistical problems may prevent the analyst from jumping to the conclusion that high tech FDI was a main cause of growth in the host country. A detailed account of such problems is beyond our scope here[3]. Yet, the positive association between high tech FDI and growth would lend support to the idea that FDI may be beneficial to the host country precisely because of its technological content. Such finding would therefore not only go some way towards explaining whether recipient countries benefit from FDI or not, but also add information regarding which kind of FDI is actually advantageous for the host countries. Such information could then be used by policy makers who would then be advised to implement policies that attract not just FDI of any kind indifferently, but that attract FDI of the type which was found to be most advantageous for the recipient country concerned.

In view of the above remarks and to make full use of the level of detail in our FDI data, to probe the existence of a positive association between FDI and growth, we compare the FDI maps in our possession to similarly constructed maps of the distribution in economic performances across countries. More specifically, since we have maps detailing the distribution of various types of FDI in 2010, we compare these maps with the corresponding map showing the geographical distribution of average annual growth rates of GDP per capita for the subsequent 5 year period between 2011 and 2015, as shown in Figure 10.

[3] Common problems encountered when dealing with panel data (time series data for a cross section of countries) are estimation bias due to feedback mechanisms from the so called independent variables back to the dependent variable (endogeneity bias) and the bias originating from omitting one or more explanatory variables from the regression equation (omitted variable bias). The latter bias may also be responsible for so called spurious relationships, whereby the positive association between two variables may induce the analyst to wrongly infer the presence of a causal relationship from one variable to the other, while that relationship is actually due to their association with a third, omitted, factor.

**Figure 10: Worldwide Distribution of GDP Per Capita Growth, 5 Years Average (2011-2015)**

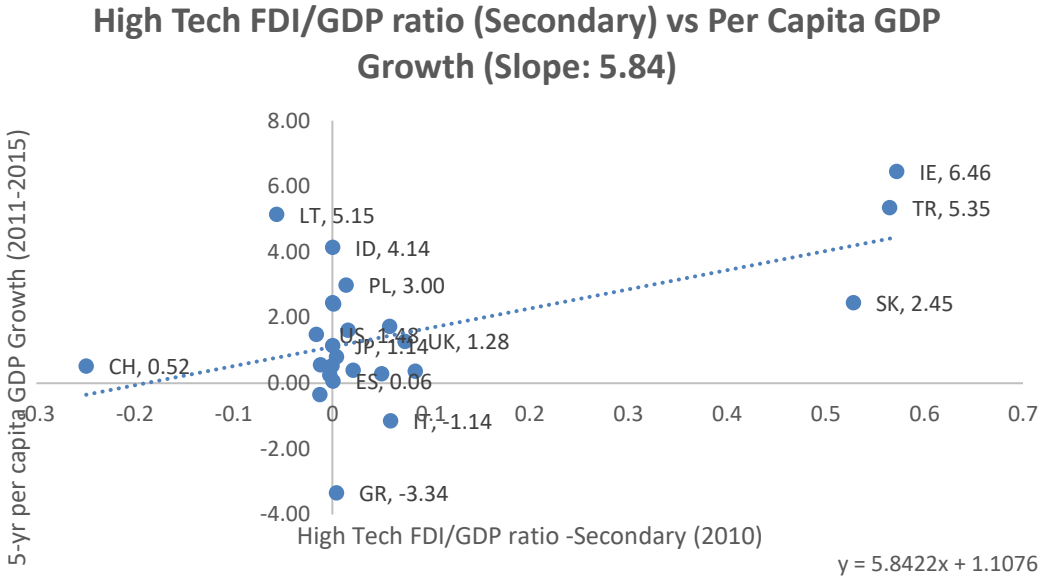

Source: Author's calculation, based on World Bank data.

A quick glance at the above map reveals that the best performing countries between 2011 and 2015 were located prevalently in Asia: Central Asia, East Asia (including China) and Southeast Asia. Unfortunately, for most of these countries, detailed FDI data were not available, particularly with respect to the manufacturing sector. However, if we restrict our attention to the countries for which we do have data, the most striking feature stemming from the comparison is that the countries which exhibited the highest inflow of manufacturing FDI with high technology in 2010, Ireland and Turkey (see Figure 4 above), also posted the highest average annual growth rate of GDP per capita in the subsequent 5-year period, at 6.46% and 5.35% respectively.

To reinforce the point, we also show in Figure 11 below, the scatterplot of data when high tech FDI/GDP ratios in 2010 (in percent) are plotted against 5-years average annual per capita GDP growth (2011-2015)[4].

[4] For the sake of improved clarity, the countries with zero FDI inflows were excluded from the scatterplot. Including them would not have changed the main features of the scatterplots in any of the cases. As a far outlier, El Salvador was also excluded from all the scatterplots.

**Figure 11: High Tech FDI/GDP Ratios in 2010 (in percent) Against 5-Years Average Annual Per Capita GDP Growth (2011-2015)**

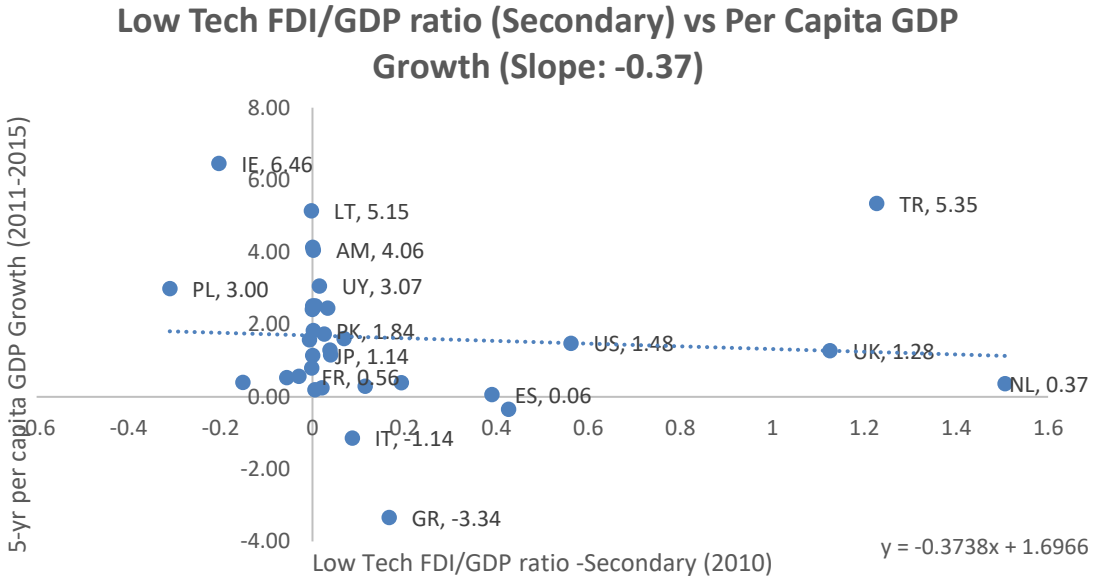



The positive association between the two variables is clear both visually and by looking at the value of the slope of the line of best fit, which is 5.84 (in order to prevent clogging the graph, we only labeled selected datapoints with respective country names). Similar scatterplots were obtained by plotting all FDI types as detailed in Table 2 against the subsequent 5-year average annual per capita GDP growth. All the scatterplots except one exhibit a positively sloped line of best fit (with differing magnitudes). The notable exception is represented by the graph pitting secondary low tech FDI/GDP ratio in 2010 against the subsequent 5-year average annual growth of per capita GDP growth (see Figure12).

In this case, remarkably, the association between the two is negative and the slope of the line of best fit is -0.37. This finding points to the very important fact that not all FDI types may be growth-fostering and the technological content of FDI is of crucial importance.

For brevity, we do not show all the scatterplots. Instead, we convey the same information in a more synthetical manner by means of table 3, which shows the slope of the lines of best fit as all FDI types (expressed as ratio to GDP) are plotted against 5-years average annual per capita GDP growth.

**Figure 12: Low Tech FDI/GDP Ratios in 2010 (in percent) Against 5-Years Average Annual Per Capita GDP Growth (2011-2015)**




For completeness of analysis, for the services sector, we observe that both the sign (positive) and the strength of the relationship with growth is much more homogeneous across the sector total and its two subtypes, high tech and low tech.

There are quite a number of studies which, like ours, probe the existence of a relationship between aggregate FDI and growth, with contradictory findings[5].

To summarize, our findings point strongly to the fact that the relationship between FDI and the growth rate of the recipient countries really depend on the type of FDI involved. After classifying FDI by technological content, we find a very strong positive relationship between high tech FDI and growth in the secondary sector. The relationship remains positive but significantly weaker for medium high tech and medium low tech FDI, but it turns negative for low tech FDI.

[5] Almfraji et al. (2014). Also see Forte and Moura (2013).

**Table 3: Slope of Lines of Best Fit by FDI Type**

| FDI types | Slope of lines of best fit |
|---|---|
| Tot FDI/GDP | 0.07 |
| FDI/GDP Primary | 0.16 |
| FDI/GDP Secondary | 0.60 |
| FDI/GDP Services | 0.06 |
| HT FDI/GDP Sec | 5.84 |
| MHT FDI/GDP Sec | 0.64 |
| MLT FDI/GDP Sec | 2.47 |
| LT FDI/GDP Sec | -0.37 |
| HT FDI/GDP Serv | 0.09 |
| LT FDI/GDP Serv | 0.08 |

Note: Slopes were calculated in Excel by plotting FDI/GDP ratios in 2010 (by FDI type) against average annual per capita GDP growth for the 5 year period between 2011 and 2015 (GDP growth data from the World Bank WDI database).

There may be many reasons for our findings. The presence of a relationship between total aggregate FDI and growth might be explained by the fact that there may be several effects at work. In particular, our findings support the argument that different FDI types seem to be carriers of different effects. The positive effects probably include technology spillovers to be interpreted broadly as inclusive of new managerial skills and novel production processes. These effects will work most strongly when FDI is characterized by high technological content. The spillover effects may become weaker as the technological content decreases, allowing for other, perhaps more negative influences to prevail.

Without going into a full-fledged listing of what these negative influences could be, it suffices here to mention that the foreign investment carried out by large multinational enterprises may crowd out existing smaller local firms in at least two ways. First, the larger multinational firms by exploiting their larger size enjoy scale economies that can raise entry barriers which in turn change the competitive structure of the market which they enter. The new, higher barriers to entry may push pre-existing local firms out of business and may discourage new ones from entering the market. Second, the multinational firms may also be able to obtain privileged access to credit. As a result, local firms may find it more difficult to finance their business. These two factors, higher barriers to entry requiring more funding and rationed access to credit which reduces funding, jointly have the potential to crowd local firms out of the market in which they operate after the entry of larger multinational enterprises. If a

sufficient number of local firms succumb, the net effect of foreign direct investment on the growth rate of the recipient economy may be negative. This is what seems to be happening when the FDI involved is of the low tech type.

From the above discussion, the message for policy makers is rather clear: FDI is not all equal and differentiating it by technological content is crucial. High tech FDI holds the highest promise of fostering economic growth in the host economy. Policy makers of countries interested in attracting FDI should strive not just to attract FDI indifferently, but they should rather focus their efforts on attracting FDI in the high technology sectors, and give less encouragement to investment flowing into low tech sectors.

## 6. Conclusions and Suggestions for Future Work

The relationship between FDI and economic growth has been so heavily studied that by now there are a large number of literature surveys that cover this topic. Yet consensus on whether the sign of this relationship is positive or not could not be reached as controversy continues to linger on.

In this study, we find evidence that the relationship is positive with some caveats. We argue that FDI is not all equal in impacting growth, a possibility that has received remarkably little attention in the literature so far, possibly due to the scarcity of data.

In this study we have argued that FDI may be an important vehicle for technology transfers, and we have shown that, particularly with respect to the Secondary sector, FDI with higher technological content has a positive association with economic growth. We also find that (at least in the Secondary sector) FDI with very low technological content has a negative association with growth. The theoretical argument for this latter finding is less clear to us. We can only speculate that when investment flows to low technology sectors, such as wood, textile, food products etc., the lack of a technological spillover leaves the recipient market vulnerable to the negative effects of FDI, such as barriers to entry and reduced access to funds for local firms in a competitive credit market.

Future work may advance knowledge on this topic in several ways. An obvious one would be to remake the analysis carried out here, but with improved data, as they become available. Another possible extension concerns whether the relationship between different FDI types and growth changes depending on whether the host country is developed or developing. It could also be investigated if there are differences between short term and long term relationships between FDI and growth. Finally, since one of the FDI types shown to have a positive association with growth is high tech, one could also look at which countries high tech FDI flows from. Then, one could use FDI data classified by geographical origin to study whether FDI originating

from those countries which are known for investing in high tech sectors, has a positive association with growth in the host country.

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