FDI and Trade in the UK: Substitutes or Complements?

G. Zarotiadis* & N. Mylonidis*

VERY PRELIMINARY DRAFT
August 2005

Abstract

The mainstay theory of the multinational firm worked out a range of different arguments that speak for both, complementary as well as substitutional links among foreign direct investment (FDI) and trade. In accordance to that, some empirical investigations detect a replacement of trade flows by FDI, while others reveal not only similarities between the FDI and trade patterns, but also a complementary effect. The main goal of this paper is to examine the relationship between FDI and trade in the UK with its primary investors. After incorporating the existing theoretical arguments in a taxonomy that fits to our purposes, we proceed with an empirical analysis that follows, and extends, that of Swenson (2004). The need for disaggregating FDI data in order to identify the multiple effects of foreign production on trade is well-documented (Pfaffermayr, 1996). Hence, we construct measures that correspond to industry-, manufacturing-, and total-FDI. Overall, our findings provide support for complementary effects of FDI on trade mainly at the highest level of aggregation.

* Department of Economics, University of Ioannina, TK 45 110, Ioannina, GREECE
E-mails: gzarotia@cc.uoi.gr; nmylonid@cc.uoi.gr
1. Introduction

Previous empirical studies on the FDI – trade interaction provide us various and often contradictory evidence as to whether FDI complements or substitutes trade. A range of contributions find a substitute relationship between the two; Ma et al (2000) and Bayoumi and Lipworth (1997) use for that purpose data from Japan, while Graham (1999) finds similar substitutability for the USA. Still, Helpman et al (2003) points out that this result may depend upon freight and tariff costs. In contrast, Brainard (1997) and Clausing (2000) for the U.S. and Co (1997) for Japan find evidence of FDI-trade complementarity. Pfaffermayer (1996) follows an atypical methodology: starting from the argument that outward FDI and exports can have common determinants such as capital, labour, skill and R&D intensities, he estimates a simultaneous equation system using time series and cross-sectional industry-level data from Austrian manufacturing and he finds a significant complementary relationship between FDI and exports in the 1980’s and early 1990’s. Liu et al (2001) also provide an interesting empirical study by applying a panel data approach to data from China. They conclude on a cyclical complementary relationship among trade flows (imports and exports) and FDI that generates a reinforcing tendency for both, which fits well to the experiences over the last two decades in the specific country. On the contrary, Blonigen (2001), Goldberg and Kein (1999) and Nakumara and Oyama (1998) find substantial evidence for the presence of both substitute and complementary relationship. Other recent empirical contributions focus on more restricted questions. Fukao et al (2003) for instance examine patterns of vertical intra-industry trade in East Asia and they find that the FDI in the particular region plays a significant role in enhancing the increase of the specific type of trade.

Still, nobody should be surprised by the fact that the existing empirical literature is in some way inconclusive regarding the specific question. On the contrary, it simply addresses the complex reality, where, as theoretical discussion already revealed, there are various, often opposite directed, links that relates trade and FDI in reversing causality. As we try to put together the recognised relationships by discussing the main alternative scenarios that justify FDI flows, we end up with the following taxonomy. The theory of Multinational Enterprises (MNEs) develops its argumentation by concentrating on two questions: On the one hand stays the issue of internalization, in other words to justify the preference by the firm to replace external contracts by direct ownership and internal hierarchies. Market imperfections are the key arguments in models that simulate such behaviour (Dunning 1981, Dunning and Rugman 1985, Hosseini 2005). On the other hand, we pose the question of location, which is directly related to our interest for the links among flows of goods and flows of production factors, in our case capital. In other words, supposing internalization and the resulting, horizontal or vertical, structure of a MNE as given, the question that has to do with to our purposes is why to locate the different activities and organizational units in a specific region.

There are three fundamental justifications that help us to explain the choice of the location and thereby the FDI flows: First, based on the tradition of standard trade theory, the reason for FDI flows from country \( o \) (as origin) to country \( h \) (as hosting) emerge due to less relative abundance of capital in \( h \) and the resulting higher relative returns to that production factor. The effects on trade are clearly negative: both, imports from and exports to \( o \) (and to the rest of the world) will be eroded (partly or fully) as the comparative advantages that stimulate this trade are suppressed. Second, based on the same tradition, a similar scenario supposes again the existence of comparative advantage.

---

1 Table 1 gives an overview of the links among FDI and trade in accordance to the related recognised scenarios.
in specific productions for country \( h \). The difference is that although shortage of capital is not the cause for these advantages, it needs to flow in \( h \) in order to utilize them. In this case of supply-driven FDI, exports from country \( h \) will be strengthened, both in the rest of the world and even in country \( o \), where capital is flowing from\(^2\). The first two scenarios provide the basis for having the so-called vertical FDI flows between dissimilar regions (Markusen and Markus 2002).

Finally, we can identify the demand-driven FDI, appearing when country \( h \) reveals a sufficient and secure demand surplus. Foreign firms choose either to export (low constant / high marginal cost alternative) or to relocate their production facilities in \( h \) (high constant / low marginal cost alternative). The size of hosting market and the extent of trade barriers and transportation costs are decisive for the actual choice.\(^3\) Demand-driven FDI substitutes country’s \( h \) imports, creating horizontally structured MNEs.

Tadesse and Ryan (2004) propose a further reasoning that combines in a way the above mentioned. Hosting country may be an ideal export platform towards other foreign markets due to its location and/or to the political economy of the trade regime governing the hosting country and its neighbours. MNEs expand horizontally trying to optimize the logistic of satisfying the regionally segmented world demand, yet, the choice of locating their investments is clearly supply-driven and it complements country’s \( h \) exports to the rest of the world.

The picture completes with three additional arguments that can be combined with the above discussed scenarios. First, there is the case of increasing returns to scale, which, if applying, comprises an additional reason for a complementary relationship among FDI and exports from the hosting country. Next, there are two arguments that justify a complementary link also to the imports of country \( h \). On the one hand, consumers habits in \( h \) may change towards the use of country’s \( o \) products, as they become more familiar with the presence of this country’s multinationals (Swenson 2004). On the other, intermediates needed for the production in the affiliates located in \( h \) are preferably obtained from country \( o \), either through the market (from other firms sited in \( o \)), or through internalized exchanges with the parent-company (intra-firm trade, see in Tang and Madan 2003).

Contemporary developments give more reasons for an overall complementarity among FDI and trade. Multinationals account for a significant portion of trade between developed countries. The fact that intra-firm trade accounts for one third of world trade today, while for the U.S., it accounts for more than 1/3 of U.S.-exports and more than 2/5 of imports (Tang and Madan 2003), speaks for itself. Nevertheless, in order to meet the complexity of the relationship in the contemporary global economy, our empirical pursuit has to be based on disaggregated FDI and trade data, allowing for multiple and often contradictory effects of foreign production on trade. Besides to the easily recognized contradiction among the mentioned FDI versus trade relationships, it is also true that they emerge at different levels of aggregation, linking FDI and trade at the product- and the industry-level, the sector- and even economy-wide. Therefore, we follow the procedure of Swenson (2004) that enables us to detect the links on different

\(^2\) See in Greaney 2003 for an alternative justification of reverse importing, based on network effects.

\(^3\) Vernon’s (1996) product cycle hypothesis discusses also this trade-off among FDI and imports by placing them in subsequent phases of the evolution of the targeted market.

\(^4\) Blonigen (2001), Zeile (1998), Bergsten and Noland (1993) and Swenson (1997) argue that firms exhibit a home-bias in their input purchasing patterns. Yet, Swenson (2004) suppose reasonably that this bias declines as foreign investment activity increases in the hosting country, which involves an additional reason for substituting imports from country \( o \).
aggregation-levels. We proceed with data from the UK for the period 1992-2003. We use the constructed measures, corresponding to industry, manufacturing and total FDI, in order to estimate the effects on trade flows of specific product groups. Unlike the study of Swenson (2004), we check for both effects on exports and imports of the specific products. This is a more reliable approach given that (a) it is misleading to argue about trade-effects and to focus only on imports, and (b) there are always analogue theoretical arguments that can be easily derived, once they have been recorded for one direction of the trade flows.

Table 1: Overview of the theoretically documented relations among FDI and International Trade flows

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Effect on:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Imports of country h from country o</td>
</tr>
<tr>
<td>Country o has a relative abundance of capital and b accordingly of labour.</td>
<td>decrease because… country’s o comparative advantage is eroded (partly or fully)</td>
</tr>
<tr>
<td>Country h has a comparative advantage in specific productions, which is not related to the use of capital.</td>
<td>increase in case… intermediate goods are imported from o for the needs of the affiliate</td>
</tr>
<tr>
<td>Case: FDI flow from country o to country h</td>
<td>increase in case … there is a movement in country’s h consumer tastes towards other o-originated products</td>
</tr>
<tr>
<td>Country h has a sufficient and (relative) secure demand surplus.</td>
<td>decrease because… initial imports are substituted by the sales of the affiliate in h</td>
</tr>
</tbody>
</table>

The rest of the paper is organized as follows. Section 2 outlines the estimation framework, section 3 describes the data, section 4 reports the empirical findings and,
finally, section 5 concludes the paper by asserting the main empirical results in accordance to the existing theoretical argumentations.

2. Estimation Framework

It is clearly demonstrated in introduction that FDI exerts a number of complex, and sometimes countervailing, effects on trade flows. Furthermore, these effects emerge at different levels of aggregation. Swenson (2004) proceeds in a classification of the effects of FDI on imports of specific commodities, in order to validate the empirical methodology that is also applied in the present paper. She distinguishes among the effect derived from FDI in the production of the specific commodity, the one resulting from FDI in the wider industry and further the effect derived from FDI in the whole sector. The last sector-wide effect should be positive, as it consists of international linkages, and positive information or demand spillovers induced by foreign investments, while the first two could be either positive or negative depending on the relative significance of the different contradicting results. Based on the complete set of the theoretical arguments, discussed in the former pages, we apply the same methodology for exports and we proceed with a joint analysis of the results.

We begin with a regression specification that evaluates (a) the effect of total FDI on imports, and (b) the effect of total FDI on exports. These are called the baseline regressions:

\[ \Delta \text{import}_{nm,t} = \beta_1 \text{TotalFDI}_{m,t-1} + \gamma X_t + \epsilon_t \]  \hspace{1cm} \text{eq. (1a)}

\[ \Delta \text{export}_{nm,t} = \beta_1 \text{TotalFDI}_{m,t-1} + \gamma X_t + \epsilon_t \]  \hspace{1cm} \text{eq. (1b)}

where \( \Delta \text{import}_{nm,t} \) and \( \Delta \text{export}_{nm,t} \) measure changes in the UK’s imports and exports, respectively, of two-digit industry \( n \) from/to partner country \( m \), \( \text{TotalFDI}_{nm,t-1} \) is the prior year total FDI flows originating from country \( m \), and \( X_t \) is a 2x1 scalar vector containing the UK’s change in real effective exchange rate and the GDP growth.

In the second regression specification changes in imports and exports are related to two categories of foreign investment: industry and manufacturing FDI. Industry FDI captures industry linkages by connecting two-digit trade flows with all foreign investment by the country that occurred in the similar two-digit industry. Manufacturing FDI is created by summing the universe of each country’s manufacturing investments for each year. Whether industry FDI effects are positive or negative is a question to be resolved through empirical analysis.

\[ \Delta \text{import}_{nm,t} = \beta_2 \text{IndFDI}_{nm,t-1} + \beta_3 \text{ManFDI}_{m,t-1} + \gamma X_t + \epsilon_t \]  \hspace{1cm} \text{eq. (2a)}

\[ \Delta \text{export}_{nm,t} = \beta_2 \text{IndFDI}_{nm,t-1} + \beta_3 \text{ManFDI}_{m,t-1} + \gamma X_t + \epsilon_t \]  \hspace{1cm} \text{eq. (2b)}

where \( \text{IndFDI}_{nm,t-1} \) and \( \text{ManFDI}_{m,t-1} \) measure prior year’s FDI flows at the industry and manufacturing level, respectively. It should be noted here that (i) all variables are measured in logs, and (ii) since we are estimating a changes specification, any fixed effects, such as those for industry, drop out of the estimating equation.

---

5 In the last section of the present paper during the assertion of the empirical findings, there is a clarifying discussion of these contradicting results.
3. Description of the Data

Three primary data sources provide the data for this study. The total, manufacturing and industry FDI data are compiled by EUROSTAT, Data Category: Economy and finance – Domain: Balance of payments – Collection: Foreign Direct Investment (FDI). These data include information on investor nationality, the two-digit industry in which the investment was placed, and transaction value. To study the effect of investment on imports, we match FDI data with data on UK industry-level imports assembled by EUROSTAT, Data Category: External Trade Statistics. Macroeconomic data are provided by the IFS database. The data set for the baseline regression covers the period 1992-2003, while for the disaggregating regression the period 1995-2003.

The FDI investment data exhibits a few notable characteristics. According to the 2005 Report by Trade and Investment the primary investors in the UK for the year 2004/05 are the USA, Canada, Germany, France and Japan in terms of new projects, and the USA, Germany, France and Japan in terms of new jobs created. The sectors that attract foreign investments (in descending order) are IT & internet & e-commerce, software, pharma & biotech, electronics, management, finance and automotive. It is clear that the service sector outweighs manufacturing and the natural question is whether the UK has become a post-manufacturing economy. According to the Report by UK Trade and Investment this is not the case since the value of the UK’s manufactured output continues to rise and the UK is still attracting investments of this kind.

Following this line of argument, the present paper focuses on manufacturing industries. The industries that experience the highest frequency of FDI flows during the sample period were mining and quarrying (SIC 1495), food products (SIC 1605), total textiles and wood activities (SIC 2295), total petroleum, chemical, rubber and plastic products (SIC 2595), total metal and mechanical products (SIC 2995), total office machinery, computers, RTVs and communication equipments (SIC 3295) and total vehicles and other transport equipment (SIC 3595).

4. Empirical Findings

Equations (1) and (2) are estimated using the generalized least squares methodology with cross section weights to correct for cross section heteroskedasticity. The impact of FDI on UK’s import changes is reported in Table 2. As the results indicate, there is a positive association between previous year total FDI and subsequent import changes when all 4 major partners are jointly considered. The point estimate suggests that a 10% increase in FDI is followed by a 4.58% increase in imports from the investing countries. This result confirms the predominant finding in the literature, which suggests that trade and FDI are complements. The results are similar when each investing country is considered separately. The estimated coefficient $\beta_1$ is positive in all instances and statistically significant at least at the 5% level. The magnitude of the coefficient ranges from 0.833 (for the USA) to 0.330 (for France). The complementary effect between total FDI and imports in the case of UK – USA is consistent with the findings reported by Greenaway et al. (1998), who using data on UK-US bilateral trade

---

6 EU FDI data are collected by Member States Balance of Payments compilers through a variety of sources. The main types of sources used are reports by the banking system on international transactions and direct surveys addressed to resident statistical units. For more detail on Member States data sources see the methodological summary published by the European Central Bank (ecb_bop03.pdf and ecb_bop03ac.pdf). Concerning Member States’ current practices, most common implementation problems and recommendations for improvement see also the final report of the Task force on FDI.
and foreign affiliate sales find that many industrial sectors display substantial amounts of both intraindustry trade and intraindustry FDI. The macroeconomic variables enter as expected. UK imports decline when the real effective exchange rate of Pound Sterling depreciates (except in the case of the USA) and increase when the UK’s GDP rises.

The estimation results of eq. (2a) are also presented in Table 2. When all 4 trading partners are jointly considered, industry FDI is negative but statistically insignificant, whereas manufacturing FDI is positive and statistically significant, providing further evidence for the complementary effect. The findings are less clear when trading partners are examined individually. In the case of the USA, both FDI variables are statistically significant; industry FDI is negative (-0.034) and manufacturing FDI is positive (0.822). The picture is reversed for the case of Japan; industry FDI is positive (0.252) and manufacturing FDI is negative (-0.220). In the case of Germany, none of the FDI variables is statistically significant. Finally, in the case of France, only manufacturing FDI is significant and negative. The macroeconomic variables have the correct sign (when significant) in almost all cases. The only exceptions appear in columns 2 and 4 where the real effective exchange rate is positive.

The estimation results are qualitatively similar when the effect of FDI on UK’s export changes is considered (Table 3). As the results indicate there consistently is a positive link between total FDI and exports, and the macroeconomic variables have the correct sign (UK exports increase with a rise in GDP and an appreciation of the real effective exchange rate of Pound Sterling). The estimation results of eq. (2b) reveal that industry FDI is positive and statistically significant only in the case of Japan, whereas manufacturing FDI is significant and positive in three out of five instances (all 4 partners, USA and Germany). The percentage change in real effective exchange rate is positive and significant for the same set of countries, whereas the percentage change in GDP is positive in all cases.

5. Conclusive Discussion

For the theoretical discussion of our empirical findings we need to think again about the arguments summarized in introduction, but this time by addressing them simultaneously on the appropriate level of aggregation. Initially, we distinguish three main scenarios that explain the choice of locating the different production activities: the first is when country \( o \) is relatively abundant in capital and \( h \) in labour, the second is when country \( h \) has a comparative advantage (besides its shortage in capital) that needs at the same time capital to be invested in order to be utilized. These two, although both produce vertically structured MNEs, they have opposite effects: according to the first both country’s \( b \) exports and imports will be eroded, while the second means a strengthening of that country’s exports. Furthermore, they have another significant difference too: The negative effect on imports according to the first scenario applies at the level of industry or the specific product, but the negative effects on exports applies at the highest level of aggregation; FDI in producing good \( x \) will affect adversely imports of that good and exports of the rest manufactured output. Differently, the positive effect on hosting country’s export that arises with the second scenario is at the industry and product level: foreign direct investments that aim to utilize the country’s given comparative advantages reinforce exporting activity of the specific product. The same is valid for FDI that intend to use the country as an export platform for neighboring markets. Although in that case the induced structure of the MNEs is a horizontal one, the positive effects for exports arise again at the product level. Yet, as the markets where
these exports are destined are not in country \( o \), the specific effect can not be revealed in the frame of the methodology that we applied in the present paper.

Regarding now the third scenario of FDI motivated by the sufficient and (relative) secure demand surplus in \( h \), the direct effect is a substitution of imports from country \( o \) (eventually also from the rest of the world). Also here, this effect appears at the industry/product level. However, discussing the three main scenarios does not give us the whole picture of the relevant theoretical reasoning. First there is the case of increasing returns to scale, which makes up an additional reason for a complementary relationship among FDI and exports from the hosting country, again at the industry/product level. Next, there are two arguments that justify a complementary link to the imports of county \( b \). On the one hand, consumer habits in \( b \) may change towards the use of country’s \( o \) products, meaning an effect mostly from FDI in the whole manufacturing and even economy wide\(^7\). On the other hand, intermediate goods needed for the production in the affiliates located in \( b \) are preferably obtained from country \( o \), which signifies also a positive effect on imports derived from FDI valid for all levels of aggregation; industry, manufacturing and economy-wide.

Having the above in mind the formerly presented results obtain additional meaning and importance. First, the fact that economy-wide FDI has a significant and clear complementary effect on import fits perfectly to the theoretical discussion, which recognises only positive effects on that level (indirectly derived due to consumer tastes effect and to home country outsourcing preferences. Analogues are the conclusions regarding FDI in the whole manufacturing, yet, with two interesting exceptions: the significantly negative estimated coefficient for imports from France and Japan. One thinkable explanation is derivable from Swenson’s argument that by intensified FDI activity the positive effect on imports due to home-country-outsourcing reverses: As foreign firms became more familiar to domestic market of the hosting country and the find more and more affiliates from suppliers from their origin country, their need to import intermediate inputs decline. Further investigation could focus on whether European Common Market along with the strengthened presence of Japanese firms in Europe justifies the findings. Finally, concluding the analysis of imports, another interesting case is significant and opposite sign of industry specific FDI on industry specific imports from the US (negative) and Japan (positive). The direct replacement effect from the third theoretical scenario of demand driven FDI applies to a large extent to the US/UK relations, while again networks characterising Japanese business tradition and/or the positive effect on British consumers seems to be strong enough to prevail over any substitutional result.

Regarding the effects on exports, we found a significant and clear complementary effect with no exception for both, economy-wide and manufacturing FDI. To begin with, the certain finding enables us to reject the 1\textsuperscript{st} scenario regarding reasoning behind the choice of locating FDI in Britain, which is also not surprising. Yet, even more it speaks for the presence of multiplicative cross-industry positive effects on international competitiveness of British commodities. Probably, being able to find easier and by lower qualitative intermediates and business services from MNEs affiliates sited in the UK signifies important gains in effectiveness. Additionally, we were able to detect significant sign of reverse importing for Japanese affiliates, which provides again an indirect evidence for the importance of the different inter-firm relation and business ethic, in accordance to the specific characteristics of each country.

\(^{7}\) This effect could arise at the product level too, especially in products characterized by a higher degree of differentiation and monopolistic competition.
References


Clausing K., 2000, Does Multinational Activity Displaces Trade?, Economic Inquiry 38, pp. 190-205


<table>
<thead>
<tr>
<th></th>
<th>4 Partners</th>
<th>USA</th>
<th>Germany</th>
<th>France</th>
<th>Japan</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total FDI</strong></td>
<td>Eq.(1) 0.458***</td>
<td>Eq.(2) 0.833***</td>
<td>Eq.(1) 0.384**</td>
<td>Eq.(2) 0.330***</td>
<td>Eq.(1) 0.350***</td>
</tr>
<tr>
<td></td>
<td>Ind FDI</td>
<td>-0.034</td>
<td>-0.187*</td>
<td>0.169</td>
<td>-0.069</td>
</tr>
<tr>
<td></td>
<td>Man FDI</td>
<td>0.822***</td>
<td>0.881***</td>
<td>0.831</td>
<td>-0.301*</td>
</tr>
<tr>
<td>% Δ REX</td>
<td>-0.050</td>
<td>0.062***</td>
<td>0.048**</td>
<td>-0.202***</td>
<td>-0.062***</td>
</tr>
<tr>
<td>% Δ GDP</td>
<td>0.839***</td>
<td>0.169</td>
<td>0.070</td>
<td>0.131</td>
<td>3.270***</td>
</tr>
<tr>
<td>R²_adj</td>
<td>0.770</td>
<td>0.977</td>
<td>0.941</td>
<td>0.977</td>
<td>0.832</td>
</tr>
<tr>
<td>DW</td>
<td>2.114</td>
<td>1.855</td>
<td>0.881</td>
<td>0.941</td>
<td>2.603</td>
</tr>
</tbody>
</table>

**Notes:** All variables are measured in logs. The dependent variable is the change in imports. The FDI variables are lagged one year relative to the dependent variable. *, **, *** denote statistical significance at the 10%, 5% and 1% levels, respectively.
Table 3. Effect of FDI on UK’s Export Changes

<table>
<thead>
<tr>
<th></th>
<th>4 Partners</th>
<th>USA</th>
<th>Germany</th>
<th>France</th>
<th>Japan</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total FDI</strong></td>
<td>Eq.(1)</td>
<td>0.616***</td>
<td>Eq.(2)</td>
<td>0.765***</td>
<td>Eq.(1)</td>
</tr>
<tr>
<td><strong>Ind FDI</strong></td>
<td>0.062</td>
<td>0.102</td>
<td>-0.117</td>
<td>-0.033</td>
<td>0.169**</td>
</tr>
<tr>
<td><strong>Man FDI</strong></td>
<td>0.062</td>
<td>0.102</td>
<td>-0.117</td>
<td>-0.033</td>
<td>0.169**</td>
</tr>
<tr>
<td>% Δ REX</td>
<td>0.056***</td>
<td>0.053***</td>
<td>0.071***</td>
<td>0.074***</td>
<td>0.003</td>
</tr>
<tr>
<td>% Δ GDP</td>
<td>0.437***</td>
<td>0.439***</td>
<td>0.127</td>
<td>0.310</td>
<td>1.044***</td>
</tr>
<tr>
<td>R² adj</td>
<td>0.930</td>
<td>0.969</td>
<td>0.941</td>
<td>0.944</td>
<td>0.924</td>
</tr>
<tr>
<td>DW</td>
<td>1.024</td>
<td>1.009</td>
<td>1.050</td>
<td>1.505</td>
<td>2.382</td>
</tr>
</tbody>
</table>

Notes: All variables are measured in logs. The dependent variable is the change in exports. The FDI variables are lagged one year relative to the dependent variable. *, **, *** denote statistical significance at the 10%, 5% and 1% levels, respectively.