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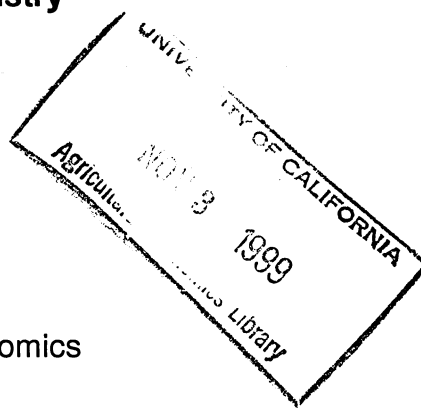
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**Foreign Direct Investment (FDI) and Trade—Substitutes or Complements?
An Application to the Processed Food Industry**

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1 Introduction

It is generally accepted in the trade literature that foreign direct investment (FDI) is encouraged by forces restricting trade (Caves, 1996). In this respect, FDI is thought to be a substitute for trade. Recent research has argued that both trade and FDI will expand with trade liberalization (Rugman, 1990). The standard theory of multinational corporations assumes substitution between trade and FDI, an assumption motivated by Mundell (1957), while previous empirical work examining the relationship has generally found strong evidence of complementarity (Blonigen, 1997b). In this respect, whether foreign production and trade are substitutes or complements still remains as an important question.

Caves (1985) characterizes exports and FDI as alternative means of entering foreign markets. Accordingly, most of the models that analyze this question start with the assumption that the firm chooses between exporting or local production (Buckley and Casson, 1981; and Markusen, 1984). On the other hand, Lipsey and Weiss (1981) found that affiliate sales increased exports, when measured at the aggregate country or industry level. They also observed some complementarity in their analysis with disaggregated data at the firm level (Lipsey and Weiss, 1984).

In this paper, we will empirically seek an answer to the question whether FDI and trade are substitutes or complements, and our main emphasis will be on the food processing industries. In this sector, sales through foreign affiliates have increased more rapidly than exports, and FDI has become the dominant form of international trade in processed foods (Bredahl, Abbott and Reed, 1995). Furthermore, food manufacturing has consistently ranked among the top industries that are characterized by FDI. Therefore, most of the relevant empirical studies consider the role of the processed food industry.¹ Similarly, the empirical analysis presented in this paper uses data from the processed food industry of Turkey at the firm level for 1980-1999 time period.

The paper is organized as follows: in Section 2, the 'substitution' and 'complementarity' concepts will be explained. Existing literature will be introduced in Section 3. Our data and the methodology that will be used in the analysis will be described in Section 4. The last section is devoted to further remarks and conclusion.

2 Behind *Substitutability* and *Complementarity*

The 'substitution' and 'complementarity' concepts within the framework of a possible relation between FDI and trade have not been clearly defined in international trade theory. Given the current content of trade theory, we do not have a proper mathematical

¹ For instance, see Connor (1983); Pagoulatos (1983); Handy and MacDonald (1989); Henderson, Vörös and Hirschberg (1996); Reed (1996); Reed and Ning (1996); Henderson, Handy and Neff (1996); Henneberry (1997); Pick et al. (1998); and Bolling, Neff and Handy (1998).

definition of these concepts, as strong as the 'substitution' and 'complementarity' concepts defined in the context of consumer theory. It is therefore necessary to clarify possible mechanisms that lead to a complementary relation.

Mundell (1957) motivates the idea of substitution between FDI and trade in a Heckscher-Ohlin model with factor mobility. In such a model, mobility of capital may substitute for trade flows.

There are different explanations for a complementary relationship between FDI and exports. One of these is due to vertical production relations, whereby an investing manufacturer may increase the exports of inputs to the host country (Blonigen, 1997b). In other words, foreign production may require inputs from the source country as well as those from the host market, giving rise to additional intra-firm trade. In particular, FDI through the acquisition of a local firm in the host country may lead to increased sourcing of parts and final goods from the parent company.

Another explanation is related to the increased demand for a firm's product because of *proximity advantages*, a term suggested by Brainard (1993, 1997). In this context, local production may have important demand enhancing effects by decreasing variable costs, facilitating marketing and design specifically geared to the market, and by creating local goodwill and customer loyalty (Belderbos and Sleuwaegen, 1998). This goodwill and customer loyalty may even increase the local demand for similar products produced by the investing company, which are not produced in the host country. In this case, the foreign investor would produce one of the goods in the host country, whereas a similar

good in the same product category would be imported to the host economy giving rise to an increase in both FDI and exports to the host country.

3 Literature

To some extent, the relationship between exports and FDI is based on the level of data aggregation. Aggregate data may mask identification of the substitution effects and exaggerate the complementarity effect (Blonigen, 1997b). In order to overcome this problem, Blonigen (1997b) analyzed product-level data from the Japanese automobile parts industry in the U.S. market. By focusing on a single product, he was assured that substitution between products was not masked by the data. He found evidence of both a substitution and a complementarity effect.

Pfaffermayr (1996a) found a significant and stable complementary relationship between FDI and exports with causation in both directions, in the Austrian manufacturing sector's outward FDI. Moreover, no evidence was found that would suggest any substitution between exports and FDI. In his analysis, he used times-series cross-section data for 7 Austrian industries over a period of 13 years. His measure of FDI was the book value of the company's stock. Since the Pfaffermayr data were aggregated at the two-digit level, his study might be subject to the problems identified by Blonigen (1997b).

In another simple model of a monopolistic, horizontally integrated, multinational firm, Pfaffermayr (1996b) found evidence of substitution between foreign production and exports, using data from a sample of Austrian firms. He also suggested that the

magnitude of this substitution would be lower under the existence of multiplant economies of scale.

Belderbos and Sleuwaegen (1998) tested the hypothesis that Japanese firms' FDI in Europe has been tariff-jumping and substituting for exports. Focusing on the electronics industry, they also used product-level foreign investment data in their analysis and found that tariff-jumping investment has substituted for exports from Japan in the European electronic goods market.

Developing a model that links domestic profits, trade flows and outward FDI in a simultaneous system of four equations, El-Osta, MacPhee and Rosenbaum (1996) found a complementary relationship between FDI and exports. They explained their finding by the tendency of multinationals to engage in intra-firm trade. Their study used four-digit Standard Industrial Classification (SIC) data for 248 industries in 1982.

There are a number of other empirical studies on the relationship between trade and FDI, which have similar results. However, the number of studies investigating this relationship with a specific focus on the food processing industries is quite limited. In their analysis of the aggregate U.S. processed food industry, Malanoski, Handy and Henderson (1997) concluded that growth in exports might stimulate FDI, but found no evidence that growth in FDI is related to a contraction in exports. For the non-OECD members as the host countries, they found that foreign affiliate sales had a positive impact on exports, a complementary relationship, whereas, for OECD countries, exports and FDI were found to be substitutes. They also concluded that the level of industrialization

within a region might influence the temporal relationship between these two alternative ways to penetrate a host market.

Using data based on a sample of 34 food processing companies, Reed and Ning (1996) found that exports and FDI were substitutes. They identified this result as being consistent with the relatively small amount of trade in intermediate food products and the view that most FDI by U.S. food firms is horizontal in nature.

Overend, Connor and Salin (1997) analyzed five large U.S. food manufacturers. In their study, they categorized the development of the relationship between exports and FDI in three phases. In this setting, overseas sales begin with exports alone, in the first phase; in the second phase, the firm implements a complementary strategy at relatively low levels of FDI; and in the third phase, the firm adopts a substitution strategy at higher levels of FDI. Using quarterly firm-level data for 1978-93, they found both substitution and complementary export-FDI sales strategies.

In their analysis of ten developed countries for the time period 1982-94, Gopinath, Pick and Vasavada (1997) found that foreign sales and exports were substitutes in the processed food industry and that FDI was tariff-jumping in this industry. The substitution effect was found to be small in magnitude. This result is an important one, since they obtained it even though the aggregate data they used could have masked substitution between these two alternatives.

4 Empirical Setting and the Data

The relationship between FDI and trade is investigated empirically within a two-equation simultaneous system. The associated two-equation system is

$$FDI_t = f(M_t, M_{t+i}, \Psi) \quad (1)$$

$$M_t = g(FDI_t, M_{t-j}, \Omega) \quad (2)$$

where FDI_t is the value of foreign direct investment in terms of the total book value of the foreign investor's stock at the time of investment, t , M_t is the value of total imports by the host country at time t , Ψ is a set of parameters which shift the demand for foreign investment, and Ω is a set of import demand shifters for the host country. M_t is a vector of import values for consecutive time periods. The subscripts i and j are the appropriate lag lengths. Among the parameters that shift the demand for foreign investment are the ones described in the previous section, namely, advertising and R&D intensity, product diversity and differentiation, and fluctuations in the relative exchange rate.² Another parameter in this set is a proxy for the macroeconomic stability of the host country economy, like the real rate of return on capital. Such a parameter is necessary particularly for countries with highly fluctuating real interest rates. In addition, the availability of raw materials and labor in the host country markets is captured by these parameters.

² See Blonigen (1997a) for an explanation of the link between exchange rates and FDI.

Import demand shifters can be defined similarly, including the distance between the source and host countries, unit transportation costs, exchange rates, as well as some general economic trend variables like per capita income. Another import demand shifter is a dummy variable on whether the source and host countries are members of the same trading bloc.

A few points are worth mentioning about our equation system. Equation (1) is designated for capturing the determinants of foreign investment in the host country. Using lagged variables on the right-hand side of the equation enables us to examine these determinants over a time frame, since possible substitution and complementary effects arise over time.

Equation (2) is designated for capturing what Mundell (1957) proposed about FDI taking place of trade flows in a Heckscher-Ohlin model with capital mobility. Right-hand side variables in both equations were determined in accordance with previous research on FDI and trade in processed food industry.

The FDI data set, obtained from the *Foreign Trade Under-secretariat, Republic of Turkey*, consists of more than 4000 firms that entered the Turkish market since January 1980. 127 of these firms are in the food-processing sector. In this data set are included the name of the company established in Turkey, the name of the Turkish partner, the total investment, share of each partner, and the year the investment was made, as well as the city in which the premises were established.

The import data for the same period were obtained from the *State Institute of Statistics, Republic of Turkey*. The data set includes import data at the product level for

all manufacturing sectors in Turkey, classified under Revision 3 trade classification system.

Since the FDI data are not classified under a trade classification system, assigning each company in the data set to the associated sub-sector group has been a serious problem. In order to overcome this potential problem, another data set including the product information of 26000 manufacturing companies in Turkey has been obtained from the *Union of Chambers of Commerce, Industry, Maritime Trade, and Commodity Exchanges of Turkey (TOBB)*. This data set provides the 8-digit Harmonized System (HS) product information for the Turkish companies registered with the *TOBB*.

In this case, the formation of the data set that will be used in the analysis includes the following steps:

- Finding the associated HS product information of the investing company from the FDI data set, using the *TOBB* database;
- Converting this HS code into Revision 3 trade classification;
- Obtaining the import data from the imports data set for the associated product group;
- Conducting the econometric tests.

All other variables, including the national income accounting data as well, came from *Foreign Trade Under-secretariat, Republic of Turkey* and *State Institute of Statistics, Republic of Turkey*, or were taken from the *International Financial Statistics* by the *International Monetary Fund*.

The data set has been obtained from Turkey for several reasons. First, Turkey, even though being a large economy in itself, is far from influencing the world prices, except for a couple of products. In this respect, it is a good example for a small-country economy, which will form the basis for assumptions in the further stages of this study. Second, Turkey has undergone a serious economic liberalization since early 1980's. In this context, it has hosted a significant amount of foreign investment. Furthermore, the Turkish government recently decided to attract more foreign investment by passing a new legal amendment that enabled international arbitrage. Turkey has to invest \$30 billion in the energy sector alone in the next 10 years and several foreign firms have been willing ready to do this (Hürriyet, 1999). Third, Turkey has almost finalized the Southeastern Anatolia Project (GAP), which includes more than 30 dams and irrigation channels in the southeastern region of the country. This project is estimated to more than twofold the current agricultural output of Turkey. In this respect, the coming several decades will most probably witness an increased level of investment in this region of Turkey, particularly in the food-processing sector.

It has already been mentioned that the relationship between FDI and trade is based on the level of data aggregation, to some extent. Aggregate data may mask identification of the substitution effects and exaggerate the complementarity effect (Blonigen, 1997b).

Using data at the firm level enables us to make our analysis without having this problem as strong as with a data set at a more aggregate product level.³

5 Conclusion and Further Remarks

There are significant discrepancies between the theory of international trade, including the theory on FDI, and the findings of associated empirical research. In this respect, we need to improve our understanding of the relation between trade phenomena and the globalization of economies through international capital flows.

In theory, a firm would select one of the two possible alternatives to penetrate a foreign country market, namely, producing in the domestic economy and exporting to the host country, or investing and performing the production activity in the host country. However, a huge body of empirical studies presents evidence of complementarity between these two alternatives.

In this paper, we have proposed a methodology to investigate this question using firm-level data from Turkey for 1980-1999 time period. A related research idea immediately emerges from the findings of this study. After knowing the relationship between FDI and trade, it is possible to extend this study to the investigation of possible welfare effects of FDI in the host country. Furthermore, with a data set including location information for the established plants, it is possible to analyze the characteristics of the inward foreign investment in a geography of trade model. Another direction for further research includes

³ A further discussion on this can be found in Blonigen (1997b).

the examination of positive technological effects to the host country production sectors from the foreign investment.

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