



AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search
<http://ageconsearch.umn.edu>
aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

Determinants of U.S. Foreign Direct Investments in Food Processing Industry: Evidence from Developed and Developing Countries

Shiva S. Makki

The Ohio State University, Columbus, OH 43210
1800 M Street, N.W., Washington, DC 20036-5831

Phone: 202 694-5316; Fax: 202 694-5823

Email: Makki.1@osu.edu; Smakki@ers.usda.gov

Agapi Somwaru

Economic Research Service, USDA, Washington, DC 20036

Christine Bolling

Economic Research Service, USDA, Washington, DC 20036

Paper prepared for presentation at the American Agricultural Economics Association Annual Meeting, Montreal, Canada, July 27-30, 2003

Journal of Economic Literature Classification numbers: F1, F2, O1, Q1

Copyright 2003 by Makki, Somwaru, and Bolling. All rights reserved. Readers may make verbatim copies of this document for non-commercial purposes by any means, provided that this copyright notice appears on all such copies.

Determinants of U.S. Foreign Direct Investments in Food Processing Industry: Evidence from Developed and Developing Countries

Shiva S. Makki, Agapi Somwaru, and Christine Bolling¹

1. INTRODUCTION

In recent years, the global market for processed food has been shifting towards developing countries. While several studies have examined the determinants of foreign direct investment (FDI) in food processing (Gopinath, Pick, and Vasavada, 1999; Bolling, Neff, and Handy, 1998; Malanowski, Handy, and Henderson, 1995; Overend, Conner, and Salin, 1995), little is known about how the level of economic development of a host country affects FDI. The main purpose of this study is to identify and analyze the factors that determine the flow of FDI across a broad spectrum of economies with different income levels and characteristics. In particular, we examine the impact of host country characteristics and macroeconomic forces on flows of U. S. FDI to developed and developing countries. We find that market size, per capita income, openness to trade, inflation rate, and exchange rate significantly affect U.S. food processing firms' decisions to invest abroad, but their influence differs between developed and developing countries.

Economic development is achieved by harnessing global technologies and local resources (McArthur and Sachs, 2001). Improvements in technology can be achieved by adapting technologies that have been developed abroad. FDI facilitates both the transfer of technologies and more efficient use of local resources. In recent years, several emerging economies, including Brazil, Mexico and China, have experienced high rates of FDI growth. These countries achieved

¹ The authors gratefully acknowledge helpful comments received from Demcey Johnson, Mark Gehlhar, and Suchada Langley. The views expressed herein are those of the authors and not necessarily those of the Economic Research Service or the U.S. Department of Agriculture. The Market and Trade Economics Division of ERS funded this research.

rapid economic growth in the last decade primarily through attracting massive amounts of FDI, which brought with it new technologies, capital, export opportunities, and organizational know-how, all in one process. This study attempts to capture the impact of such economic development on the flow of FDI.

This paper is organized as follows. In the next section, we provide some background on U.S. FDI, affiliate sales, and trade in food processing industry, and discuss the role of economic development and a stable macroeconomic environment in attracting FDI. We then examine how the relationship between exports and affiliate sales varies with the level of economic development. Section 3 presents the econometric model used to identify determinants of FDI in the processed food industry. Section 4 presents empirical results, comparing the determinants of FDI in developed and developing countries, while section 5 presents the conclusions of the paper.

2. U.S. FDI IN FOOD PROCESSING INDUSTRY

World trade in processed food has been growing in response to increasing consumer demand for diversified diets and types of food adapted to changing lifestyles. As the demand for processed food increases, some multinational food processing companies respond by investing directly in processing plants in major markets abroad. In a globalized economy, direct investments are often necessitated by pressures to reduce transaction costs, to access foreign markets, and, in some cases, to circumvent trade and transport barriers. Foreign production allows the parent companies to remain competitive globally by taking advantage of lower costs of production in some host countries. This would also allow food-processing firms to modify their products to suit the host country consumer tastes and preferences.

U.S. foreign direct investment in processed food increased from \$16 billion in 1990 to \$37 billion in 2000 (Table 1). Nearly half of the U.S. FDI in food processing industry has been in the European Union (EU). Even though a large proportion of U.S. processed food FDI is in developed countries, U.S. FDI in the developing and transition economies has been increasing rapidly in recent years. U.S. FDI in Central and South America increased from less than \$3 billion in 1990 to \$11 billion in 2000, with an annual growth rate of 14 percent. U.S. FDI in Asia increased from less than \$2 billion to over \$4 billion, with an annual growth rate of 8 percent (Table 1). U.S. FDI in Brazil, Chile, China, India, and Mexico grew rapidly in the 1990s (Figure 1). Per capita income growth and favorable economic conditions in these countries have certainly contributed to the increase in the demand for processed food.

Sales from U.S. foreign direct investment in the processed food industry increased from \$76 billion in 1990 to \$138 billion in 2000, with an annual growth rate of 6 percent (Table 1). During the same period, U.S. exports of processed food increased from \$19 billion to \$30 billion, with an annual growth rate of 5 percent. U.S. foreign affiliate sales in processed food increased rapidly in Central and South America with an annual growth rate of 10 percent between 1989 and 1998. Foreign affiliate sales in Asia grew at an annual rate of 6 percent during that period. Since 1995, U.S. exports of processed food have been stagnant around \$30 billion, while U.S. foreign affiliate sales have grown from \$115 billion to \$138 billion, a net increase of \$23 billion (Table 1).

2.1 Stages of Economic Development and FDI

There appear to be significant differences in the determinants of FDI between developed and developing countries. There are undoubtedly many explanations for the differences in the extent of FDI among these countries. For example, Fung, Iizaka, and Parker (2002) in their analysis of U.S. and Japanese direct investments in China find that the level of GDP, labor productivity, and

infrastructure are the important determinants of FDI. Furthermore, they show that the importance of these variables differs across source countries. Coughlin, Terza, and Arromdee (1991), analyzing the flow of FDI to different states within the U.S., indicate that states with higher per capita income, unemployment, and densities of manufacturing activity attracted relatively more FDI, while states with higher wage rates and tax rates deterred FDI. Apart from few limited attempts, economics literature has not yet offered detailed analysis of how the structural characteristics and economic policies of host countries affect FDI.

Review of business surveys indicate that FDI is affected by investors' confidence in property rights, rates of taxation, trade policies, macro-economic and political stability, the size of the market, and infrastructure (World Economic Forum, 2002; World Competitiveness Year Book, 2002). These factors differ across countries and are significantly different between developed and developing countries. One of the most frequently used measures of these institutional and policy factors is the Growth Competitive Index (GCI), which rates countries on a combination of factors. The GCI is a composite index reflecting a country's technological advances, public institutions, and the macroeconomic environment (World Economic Forum, 2002). Figure 2 shows a positive relationship between the GCI and the U.S. FDI in processed food. The figure also reveals that the relationship is stronger in developing countries than in developed countries. This implies that U.S. FDI in processed foods is likely to grow more rapidly in developing economies than in developed economies – especially for those developing countries with improved technology and institutions, and sound economic policies.

2.2 FDI and Trade

The relationship between foreign direct investment and trade has been much discussed in the economics literature. This relationship is influenced by various factors such as total factor

productivity and monetary and fiscal policies in the U.S. and in host countries. In addition, host country characteristics such as market size, per capita income, infrastructure and markets, as well as the risks associated with investments and/or trade, affect the relationship between FDI and trade.

Past studies disagree on the expected relationship between FDI and trade. Linder (1961), Deardorff (1997), and Markusen (1986) conclude that capital rich countries will trade more with other capital rich countries than with capital poor countries. The Linder-style hypothesis states that countries with similar levels of per capita income will have similar preferences and similar but differentiated products, and thus will trade more with each other. Frankel (1997 p.132) states that trade causes investment, rather than the other way around. In other words, trade and FDI are expected to have a strong complementary relationship, especially after the Uruguay Round, as liberalized trade has also led to liberalized rules for FDI.

In contrast, several studies based on the Heckscher-Ohlin theory of comparative advantage suggest a negative relationship between FDI and trade. These studies argue that developing countries produce goods intensive in unskilled labor, and trade them to developed countries for goods intensive in capital and skilled labor. These studies have suggested a negative relationship between outward FDI and exports (see Ruffin, 1984). Finally, the Helpman-Krugman hypothesis predicts that trade and FDI stem from economic development, not from similarity of the stage of development (Frankel, 1997, p. 59). Countries with similar levels of output per capita will trade more than countries with dissimilar levels.

Analytical work on the relationship between FDI and trade in the U.S. processed food industry has led to mixed conclusions. Malanowski, Handy, and Henderson (1995) found evidence that exports may serve as a precursor to foreign direct investment. Overend, Conner, and

Salin (1995) explored the relationship between exports and FDI for six food manufacturing firms and found three disparate patterns among firms, suggesting that the export-FDI relationship is ambiguous. Analyzing U.S. FDI in the food processing industry and U.S. exports of processed food in OECD countries, Gopinath, Pick, and Vasavada (1999) conclude that FDI and exports are substitutes.

The relationship between FDI and trade is ambiguous and may require an empirical answer. On one hand, FDI and trade can be complements in those markets where a multinational company is able to increase both exports and affiliate sales. This is likely to happen in a new market or in a situation where the company imports the intermediate input to be further processed and sold in the host country. On the other hand, exports and FDI can also be substitutes if affiliate sales displace home country exports. It is often difficult to generalize the relationship between FDI and trade as this varies by product, country, and over time.

3. MODEL SPECIFICATION

3.1 Theoretical Background

This section briefly outlines a theoretical model of a representative multinational firm that can produce goods both at home and abroad. The firm must decide whether or not to undertake FDI, which involves the choice of the amount of FDI, the quantity of exports from home to foreign markets, and the level of foreign production. Firm must also decide the optimal level of capital and labor in both home and foreign production facilities. The model structure is similar to that of Baja-Rubio and Sosvilla-River (1994), Barrel and Pain (1996), and Fung, Iizaka, and Parker (2002).

Baja-Rubio and Sosvilla-River examine the inflow of FDI to Spain, where a multinational firm chooses the level of FDI that minimizes the total cost of producing at home and foreign plants. They derive a reduced form equation for FDI using a cost minimization framework. The equation relates FDI to demand, costs of production, trade barriers, and other observable country characteristics. Fung, Iizaka, and Parker analyze the determinants of U.S. and Japanese investments in China using a regression model, where FDI is a function of variables that captures the attractiveness of different regions of China to direct investments. Explanatory variables include GDP of the region, wage rate, education level, roads and railway facilities, and various policy variables. Both studies focus on a single country and, therefore, the results do not shed much light on the importance of host country characteristics and policies on the inflow of FDI.

Barrel and Pain, on the other hand, analyze investments by U.S. companies in OECD countries. Assuming that a multinational firm chooses direct investments to maximize its profits, they derive an estimable reduced form equation for FDI. By focusing on only developed OECD countries, the study fails to identify factors that determine the growth of FDI in developing countries. The earlier studies also failed to account for simultaneity between FDI activity and exports. Our model includes developed and developing countries as well as various country characteristics that help determine the flow of FDI. In particular, we analyze a cross section of developed and developing countries to assess the relative importance of factors that determine the flow of FDI.

We consider the case of a firm that maximizes its current discounted value of profits. The firm produces and sells its output both in domestic and foreign markets. Foreign demand is met by the goods produced and exported from home, as well as produced in the host country by the firm's affiliates. The profit maximizing firm faces three decisions: quantity to be sold in the

domestic market, quantity to be sold in foreign market, and quantity of exports from domestic to foreign markets. Profits (π) are given by:

$$\pi = \text{Max} \left\{ P_h q_h + P_f q_f + P_x x_{hf} - C_h(q_h + x_{hf}) - C_f(q_f, \psi_f) \right\} \quad (1)$$

with $q_h, q_f, x_{hf} > 0$; $q_h + x_{hf} + q_f = Q$;

where q_h is the quantity produced at home for domestic sales, q_f is the quantity produced and sold in the foreign market, x_{hf} is the quantity produced at home for exports, P_h is the price in the home market, P_f is the price in the foreign market, P_x is the export price, and ψ_f is the policy and other macroeconomic variables that may affect prices and costs in the foreign country. ψ_f includes such factors as market size, per capita income, openness of the economy, taxes on income and profits, inflation rates, and exchange rates. P_h and P_x are assumed to be exogenous to firms, while P_f is determined by $(q_f + x_{hf})$ and various host country characteristics (ψ_f). $C_h(\cdot)$ and $C_f(\cdot)$ are the minimized costs of producing at home and abroad, respectively. Subscript h and f refer home and foreign markets, respectively. All costs and prices are expressed in U.S. dollars.

Using equation (1), we define the Lagrangean function as:

$$\mathcal{L} = P_h q_h + P_f(\cdot) q_f + P_x x_{hf} - C_h(q_h + x_{hf}) - C_f(q_f, \psi_f) - \lambda(Q - q_h - x_{hf} - q_f) \quad (2)$$

Differentiating equation (2) with respect to q_h , q_f , x_{hf} and λ we obtain the necessary conditions for the solution of the constrained optimization problem:

$$q_h: \quad P_h - \frac{\partial C_h(\cdot)}{\partial q_h} - \lambda = 0 \quad (2a)$$

$$q_f: \quad P_f(\cdot) + q_f \frac{\partial p_f(\cdot)}{\partial q_f} - \frac{\partial C_f(\cdot)}{\partial q_f} - \lambda = 0 \quad (2b)$$

$$x_{hf}: \quad P_x + q_f \frac{\partial p_f(\cdot)}{\partial x_{hf}} - \frac{\partial C_h(\cdot)}{\partial x_{hf}} - \lambda = 0 \quad (2c)$$

$$\lambda: \quad Q - q_h - q_f - x_{hf} = 0 \quad (2d)$$

Using the implicit function theorem, we can assume that the marginal conditions (2a – 2d) are invertible to allow us to solve for q_h , q_f , and x_{hf} in terms of the exogenous factors (see Barrell and Pain for more details on using implicit function theorem for solving the marginal conditions).

Once the decision to produce abroad has been made, the firm faces another choice involving factor substitution within the production facilities at home and abroad. Assuming that production takes place using two inputs labor (L) and capital (K), the home and foreign plants would minimize their total costs:

$$C_h = w_h L_h + r_h K_h \qquad C_f = w_f L_f + r_f K_f \qquad (3)$$

subject to the constraint given by the respective production functions:

$$Q_h = Q_h(L_h, K_h) \qquad Q_f = Q_f(L_f, K_f, \psi_f) \qquad (4)$$

where Q_h is the production at home ($q_h + x_{hf}$), Q_f is the production abroad, w denotes the wage rate, and r denotes the cost of capital. Using (3) and (4), we define two separate Lagrangean functions as:

$$\mathcal{L}_h = w_h L_h + r_h K_h + \lambda_h(Q_h - Q_h(L_h, K_h)) \qquad (5)$$

$$\mathcal{L}_f = w_f L_f + r_f K_f + \lambda_f(Q_f - Q_f(L_f, K_f, \psi_f)) \qquad (6)$$

which yield two sets of first-order conditions. The first-order conditions for \mathcal{L}_h is given by:

$$L_h : \quad w_h - \lambda_h \frac{\partial Q_h(\cdot)}{\partial L_h} = 0 \qquad (5a)$$

$$K_h : \quad r_h - \lambda_h \frac{\partial Q_h(\cdot)}{\partial K_h} = 0 \qquad (5b)$$

$$\lambda_h : \quad Q_h - Q_h(L_h, K_h) = 0 \qquad (5c)$$

While the first-order conditions for \mathcal{L}_f is given by:

$$L_f: \quad w_f - \lambda_f \frac{\partial Q_f(\cdot)}{\partial L_f} = 0 \quad (6a)$$

$$K_f: \quad r_f - \lambda_f \frac{\partial Q_f(\cdot)}{\partial K_f} = 0 \quad (6b)$$

$$\lambda_f: \quad Q_f - Q_f(L_f, K_f) = 0 \quad (6c)$$

Once again, using implicit function theorem, we can assume that the marginal conditions (5a – 5d) and (6a – 6d) are invertible to allow us to solve for optimal values of L_h , K_h , L_f , and K_f in terms of exogenous variables in the system. The exogenous variables include costs of production (wage rates, interest rates), prices, and various country characteristics. Since $C_h(\cdot)$ and $C_f(\cdot)$ are minimized costs, optimal levels of q_h , q_f , and x_{hf} in equation (2) include optimal values of L_h , K_f , L_f , and K_f in equations (5) and (6).

3.2 Empirical Analysis

For empirical analysis, we make two critical assumptions that simplify our model without compromising the objectives of the paper. First, we assume that all of home production is exported. Since the focus of this study is direct investments in foreign markets, we ignore sales in the home market. Second, we assume that there are no exports from host countries to home country. The latter assumption is also supported empirically to some extent. Available data on FDI in the U.S. food processing industry indicates that only a small (about 2%) of foreign production is exported back to the United States (Gopinath, Pick, and Vasavada, 1999). These two assumptions allow us to focus on foreign markets and host country characteristics that determine the flow of FDI. This leaves us with six endogenous variables q_f , x_{hf} , L_h , K_h , L_f , and K_f . Due to data limitations, however, we only estimate q_f , x_{hf} , L_f , and K_f which represent, respectively, foreign affiliate sales, exports from home country, employment in the foreign

production facility, and capital used in foreign production financed by means of direct investments in the foreign country.

The econometric model estimates U.S FDI, affiliate FDI sales, affiliate employment, and exports using a system of equations that accounts for many of the host country characteristics.

The empirical model in the reduced form is as follows:

$$\begin{aligned}
 FDI_{it} &= f(P_{it}, W_{it}, K_t, GDP_{it}, PCI_{it}, O_{it}, T_{it}, X_{it}, I_{it}, FP_{it}, \varepsilon_1) \\
 SAL_{it} &= f(P_{it}, W_{it}, K_t, GDP_{it}, PCI_{it}, O_{it}, T_{it}, X_{it}, I_{it}, FP_{it}, \varepsilon_2) \\
 EMP_{it} &= f(P_{it}, W_{it}, K_t, GDP_{it}, PCI_{it}, O_{it}, T_{it}, X_{it}, I_{it}, FP_{it}, SAL_{1t}, \varepsilon_3), \\
 EXP_{it} &= f(P_{it}, W_{it}, K_t, GDP_{it}, PCI_{it}, O_{it}, T_{it}, X_{it}, I_{it}, FP_{it}, \varepsilon_4)
 \end{aligned} \tag{7}$$

where subscript i represents country index, subscript t denotes time period, FDI_{it} is the U.S.

foreign direct investment in country i in time t (the subscripts for country and time are dropped for

exposition purposes), SAL is the U.S. foreign affiliate sales, EMP is foreign affiliate employment,

EXP is U.S. processed food exports, P is the export prices, indicated by the unit value of imports,

W is the relative wage rate (ratio of host country wage rate to U.S. wage rate), K is the cost of

capital indicated by the real interest rates in the U.S., GDP is the host country gross domestic

product in purchasing power parity (PPP) adjusted dollars, PCI is the per capita income in the host

country, also in PPP-dollars, O indicates the openness of the economy, measured by the imports of

goods and services as a percentage of GDP, T is the tax rate (taxes collected on income, profits,

and capital gains in the host country expressed as percentage of total taxes), X is the real exchange

rate expressed as the ratio of local currency to the U.S. dollar (indexed 1989=100), I is the annual

inflation rate in the host country, FP indicates the ratio of domestic food price index to host

country food price index, and ε_k (where $k = 1, 2, 3, 4$) is the error term of the k th equation in (7).

Choice of some explanatory variables (e.g. market size, per capita income, factor prices)

may not require additional justification, while some others (e.g. inflation rate, exchange rate, trade

openness, tax on investment income) may require some explanation.² We have used inflation rate as a proxy for the degree of macroeconomic stability of a country. Macroeconomic instability is known to reduce the flow of FDI by increasing the cost and risks of investment (Fisher and Modigliani, 1978). Exchange rate, on the other hand, is an indicator of the strength (or weakness) of foreign country currency relative to domestic currency. Multinational companies may decide whether to export or produce in the foreign country based on the stability of exchange rates (Froot and Stein, 1991). The exchange rate also indicates the stability of monetary and fiscal policies of a country. A lower inflation rate and stable exchange rate should mean a better climate for foreign investment, so favoring the inflow of FDI. Openness of the economy and tax rates on investment income are also important determinants of FDI. High import barriers in the host country, for example, may induce higher FDI to gain access to the host-country market.

It is likely that the macroeconomic and other host country characteristics would affect all four equations to varying degrees. That is, FDI, affiliate sales, affiliate employment, and exports are affected by factors that are tied to the economy as a whole and to factors that are specific to the activity. As such it would be reasonable to allow contemporaneous correlation among the error terms. We use Seemingly Unrelated Regression (SUR) method, which produces more efficient estimates of parameters when there is contemporaneous correlation in the errors across equations (Greene, 1997). This empirical specification allows us to draw conclusions on FDI and export preferences in the host countries. The system approach allows us to determine all the endogenous variables as a system of equations and facilitate the discussion of how each explanatory variable affects different endogenous variables simultaneously. All variables are expressed in the natural

² We do not include GCI in the model because several explanatory variables used in the estimation of equation (7) are used to construct GCI.

logarithmic form for estimation purposes, so that the estimated coefficients will provide measures of elasticity.

We separate developed and developing countries based on U.N. criteria for classifying countries based on per capita income. High-income OECD countries are considered as developed countries (per capita annual income of more than 12,000 PPP-adjusted dollars), while low and middle income countries are considered as developing countries. Based on these criteria, we have 19 developed and 17 developing countries in our sample. We applied the Hausman test to determine whether the classification of the sample into developed and developing countries is justified. For the entire sample, including both developed and developing countries, the Hausman test indicates that the country characteristics matter and their effects are statistically significant. However, when we divide the sample into developed and developing countries and apply the Hausman test to each group separately, we find that country characteristics are not significant for developed countries and moderately significant for the developing countries.

Classification of countries into developed and developing allows us to distinguish statistically how various factors affect FDI at different stages of economic development. We expect host country characteristics to play a significant role in determining FDI in processed food, affiliate sales, affiliate employment, and U.S. processed food exports. We expect factors such as the price of U.S. processed food exports, market size, personal income, openness, and tax rates in the host country, to have different effects in developed and developing countries.

3.3. Data

We examine U.S. processed food industry FDI and exports using panel data. Data on U. S. FDI in the food processing industry (Standard Industrial Classification Category 20 – SIC20) are obtained from the U.S. Department of Commerce. Variables include total FDI, U.S. affiliate sales,

U.S. affiliate employment, and wages paid by U.S. affiliates. Data on U.S. exports of processed food – SIC20 – are obtained from the UN Trade database. Quantitative data on various host country characteristics are obtained from World Development Indicators (WDI) database. The WDI database, published by the World Bank and International Monetary Fund, include such variables as GDP, per capita income, trade, tax rates, interest rates, inflation rates, exchange rates, consumer price index, and food price index. The data cover 36 countries for the years 1989 through 2000.

4. RESULTS

Table 2 presents parameter estimates from the system of equations for the developed and developing countries. Our econometric analysis shows that the choice of a host country for FDI depends on various country characteristics and policies. The importance of country characteristics appears to vary between developed and developing countries.

One of the most important characteristics of host countries vis-à-vis FDI is market size. We would expect larger market size, indicated by host country's PPP-adjusted GDP, to attract greater outside investment. In the case of developed countries, market size is positively related with FDI, affiliate sales, and exports, as we would expect (Table 2). For example, a one- percent increase in developed country GDP is associated with a 1.6% increase in FDI, 1.1% increase in affiliate sales, and 1.1% increase in exports. However, market size does not play a significant role in promoting FDI by U.S. firms in developing countries (the estimated coefficient for market size is not statistically significant). Affiliate sales and exports are, however, positively influenced by the developing country's market size, as expected.

As argued earlier, economic development is a key determinant of FDI in the food processing sector. For this study, the level of economic development is measured by PPP-adjusted per capita income. Results presented in Table 2 indicate that per capita income is positively related to FDI, affiliate sales, and exports in developing countries. The estimated coefficients for per capita income are statistically significant for developing countries. A 1% increase in the per capita income of a developing country leads to 1.7% increase in U.S. FDI, 1.3% increase in affiliate sales, and 0.55% increase in U.S. exports.

In the case of developed countries, on the other hand, per capita income appears to be negatively related to FDI and affiliate sales. The estimated parameters are negative and statistically significant (Table 2). High income developed countries already consume large quantities of processed food and any increase in income may increase the consumption of fresh and other less-processed foods. In developing countries, on the other hand, the demand for high value processed food, typically purchased by higher income consumers, increases with income (Regmi, 2000). Higher per capita income appears to attract FDI in developing countries, irrespective of market size. As the growth in FDI in developed markets slows down, fast growing developing economies, including China, India, Malaysia, Indonesia, Brazil, Mexico, Chile, and South Africa could emerge as potential growth markets for U.S. processed food products. This suggests that the level of economic development of a country could be key to the decision to invest in those markets, which is not surprising because demand for processed food tends to increase with income.

The openness of countries and their tax rates on income, profits, and capital gains are critical factors that influence foreign investments and trade. Openness of a country to outside investments and trade is likely to have a positive effect on FDI. A country that is more open is

often forced to improve institutions and infrastructure and is likely to be less corrupt (Ades and Di Tella, 1999). Trade liberalization often includes investment liberalization. Our analysis indicates that openness, indicated by imports of goods and services as a share of nation's GDP, is positively associated with FDI in the case of developed countries and is not a significant factor in developing countries (Table 2). In the case of developed countries, the estimated coefficients for openness are positive and significant in all four equations. In the case of developing countries, on the other hand, openness is positively related with only affiliate sales and exports. This may be because, in a more open country, consumers are more aware of products that are available in the global market place.

Taxes on income, profits, and capital gains reflect the institutional impediments to FDI. Paradoxically, these appear to have a positive influence on FDI in developed countries (Table 2). One explanation for this relationship is that the tax rate may be correlated with some omitted variables that favors FDI in developed countries. Taxes on income, profits, and capital gains do not appear to have a significant influence on FDI or affiliate sales in developing countries.

The inflation rate, measured as the annual percentage change in consumer prices, is expected to be negatively associated with FDI. Our results support this argument only for developing countries; however, the estimated coefficient is not statistically significant (see table 2). In the case of developed countries, the inflation rate is found to be positively associated with FDI. One possible explanation for this unexpected relationship is, perhaps, inflation rates in developed countries were low and any changes in inflation unlikely to have dissuaded firms from investing in foreign markets.

The exchange rate captures the effects of broader economic policies on both FDI and trade. In a global economy characterized by less than perfect capital markets, fluctuations in exchange

rates are known to adversely affect outside investment and trade (Froot and Stein, 1991). The effect of the exchange rate appears to be significantly different between developed and developing countries (Table 2). As the U.S. dollar appreciates relative to currencies in developed countries, FDI, affiliate sales, and employment decrease in those countries. For example, a 1% appreciation of the U.S. dollar will cause FDI to fall by 4% and affiliate sales to fall by 3%.

In the case of developing countries, the exchange rate effect is generally positive. This suggests that as the dollar appreciates vis-à-vis the currencies of importing countries, FDI becomes more attractive relative to exports. That is, appreciation of the U.S. dollar against the host country currency decreases the cost of acquiring assets and building production plants in the host country.

Our model allows us to examine whether the comparative advantage theory holds, even after accounting for host country characteristics. For example, the relative wage rate is a critical factor that determines the choice of destination country as well as the choice of FDI or exports. Multinational companies often choose production locations based on labor costs. For this study, the wage rate is expressed as the ratio of host country wage rates (paid by U.S. affiliates) to U.S. wage rates in the manufacturing sector. Our results show a negative relationship between affiliate employment and wage rates in both developed and developing countries, as expected (Table 2). However, the size of the effect is different across groups. A 1% increase in the relative wage rates leads to a decrease in the affiliate employment by 2% in developed countries and by 0.5% in developing countries.

The U.S. interest rate represents the opportunity cost for U.S. firms of investing in foreign markets. We use commercial bank lending rates in the U.S. in our estimation. As the interest rate rises, the opportunity cost of investing abroad increases. These rates are used by commercial

banks for meeting the short- and medium-term credit needs of the private sector. Our results, presented in Table 2, indicate that the U.S. interest rate is not a significant factor in either developed or developing countries.

4.1 Foreign Affiliate Sales and Exports

Testing for any kind of relationship between foreign affiliate sales and exports is not the main purpose of this study. But our analysis allows us to make some deductions on the nature of the relationship between affiliate sales and exports. Our results indicate that an increase in the price of exports causes sales from FDI affiliates to decrease in the developed countries and increase in the developing countries (Table 2). In the case of developed countries, for example, a 1% increase in export prices causes affiliate sales to fall by 4%, but increases exports by 2%. This suggests that affiliate sales and exports are substitutes in developed countries.

In the case of developing countries, an increase in export price increases both exports and affiliate sales. A 1% increase in export price increases affiliate sales 2% and exports by about 1%. This suggests a possible complementary relationship between affiliate sales and exports. The complementary relationship implies that higher levels of production and sales in a country by U.S. owned affiliate firms is associated with higher U.S. exports to that country. One possible explanation for this complementary relationship is that affiliate sales introduce new product and the ensuing increase in demand for that product is met by increased imports and vice versa.

5. CONCLUDING REMARKS

This paper analyzed the effects of host country characteristics on the foreign direct investments by the U.S. food processing industry in developed and developing countries. The most important host country characteristics attracting U.S. FDI have been market size and high per capita income,

but their influence differs between developed and developing countries. In the case of developed countries, large market size has a positive influence, while high per capita income has a negative effect on foreign direct investment. In the case of developing countries, market size is not a major determinant of FDI, while per capita income is a very significant factor in attracting FDI.

We also find the openness of a country and macro economic factors, including inflation rates and exchange rates, to have a significant impact on U.S. food processing firms' decisions to invest abroad. Our results also indicate that relative wage rates are important in determining investment in food processing plants abroad.

We find substitutability between foreign affiliate sales and exports in the case of developed countries, which is consistent with earlier findings using data from OECD countries. In the case of developing countries, on the other hand, we find a complementary relationship between U.S. foreign affiliate sales and exports. As countries prosper, consumers change their diets from staples to more processed and packaged food items. Under favorable circumstances new opportunities will develop for food processing in emerging markets in Africa, Asia, and South America, where the demand for processed food is growing and costs of production are still relatively low.

REFERENCES

- Ades, A. and R. Di Tella. "Rents, Competition, and Corruption." *American Economic Review* 89, 982-993, September 1999.
- Barrell, Ray and N. Pain. "An Econometric Analysis of U.S. Foreign Direct Investment." *The Review of Economics and Statistics* 78, 200-207, 1996.
- Bolling, C., S. Neff, and C. Handy. "*U.S. Foreign Direct Investment in the Western Hemisphere Processed Food Industry.*" ERS Agr. Res. Report No. 760, Washington, DC., 1998.
- Connor, J. M. "Determinants of Foreign Direct Investment by Food and Tobacco Manufacturers." *Amer. J. Agr. Econ.*, 65, 395-404, 1983.
- Coughlin, C., J. V. Terza, and V. Arromdee. "State Characteristics and the Location of Foreign Direct Investment within the United States." *Review of Economics and Statistics* 73, 4:675-683, November 1991.
- Deardorff, Alan. "Determinants of Bilateral Trade: Does Gravity Work in a Classical World?," in the *Regionalization of the World Economy*, in Jeffrey Frankel (ed.), University of Chicago Press, Chicago, 1997.
- Frankel, Jeffrey. *Regional Trading Blocks*, Institute for International Economics, Washington, DC, October 1997.
- Fisher, S. and F. Modigliani. "Towards an Understanding of the Real Effects and Costs of Inflation." *Weltwirtschaftliches Archiv*, 4, 810-33, 1978.
- Froot, K. A. and J.C. Stein. "Exchange Rates and Foreign Direct Investment: An Imperfect Capital Markets Approach." *Quarterly Journal of Economics* 106, 1191-1217, 1991.
- Fung, K. C., H. Iizaka, and S. Parker. "Determinants of U.S. and Japanese Direct Investments in China." *Journal of Comparative Economics* 30, 567-578, 2002.
- Gopinath, M., D. Pick, and U. Vasavada. "The Economics of Foreign Direct Investment and Trade With An Application To The U.S. Food Processing Industry." *Amer. J. Agr. Econ.*, 81, 442-452, 1999.
- Greene, W. *Econometric Analysis*. Macmillan Publishing Company, New York, 1990.
- Helpman E. and P. R. Krugman. *Market Structure and Foreign Trade; Increasing Returns, Imperfect Competition and the International Economy*, MIT Press, Cambridge, Massachusetts, 1985.
- Linder, S. B. *An Essay on Trade and Transformation*, New York, John Wiley and Sons, 1961.
- Lipsey, R. E. "Outward Direct Investment and U.S. Economy." Working Paper No. 4691, National Bureau of Economic Research, Cambridge MA, 1994.
- Lipsey, R. E. and M.Y. Weiss. "Foreign Production and Exports in Manufacturing Industries." *Review of Economics and Statistics* 63, 304-308, November 1981.

Malanowski, M., C. K. Handy, and D. R. Henderson. "Time Dependent Relationships in U.S. Processed Food Trade and Foreign Direct Investment." NCR-182 Conference, Foreign Direct Investment and Processed Food Trade, Arlington, VA, 1995.

Mcarthur, J. W. and J. D. Sachs. "The Growth Competitiveness Index: Measuring Technological Advancement and the Stages of Development." The Global Competitiveness Report 2001-2002, World Economic Forum, Geneva, Switzerland, 2001.

Overend, C., J. M. Connor, and V. Salin. "Foreign Direct Investment and U.S. Exports of U.S. Processed Foods: Complements or Substitutes?" NCR-182 Conference, Foreign Direct Investment and Processed Food Trade, Arlington, VA, 1995.

Regmi, A. "Changing Structure of Global Food Consumption and Trade." Agriculture and Trade Report, Economic Research Service, USDA, Washington, DC., 2001.

Ruffin, R. J. International Factor Movements, In Jones, R.W. and P.B. Kenen (eds), *Handbook of International Economics*, North-Holland, Amsterdam, 1984.

Table 1
U.S. Foreign Direct Investment, Foreign Affiliate Sales, and Exports in Processed Food,
1989-2000

	----- Europe -----			----- Asia -----			----- C. and S. America -----			----- World -----		
	FDI	Sales	Exports	FDI	Sales	Exports	FDI	Sales	Exports	FDI	Sales	Exports
YEAR	(bil. \$)	(bil. \$)	(bil. \$)	(bil. \$)	(bil. \$)	(bil. \$)	(bil. \$)	(bil. \$)	(bil. \$)	(bil. \$)	(bil. \$)	(bil. \$)
1989	5.59	41.00	3.25	1.77	11.06	7.56	2.37	5.20	1.97	11.89	70.20	17.63
1990	7.83	44.50	3.43	2.10	11.62	7.78	2.99	6.05	1.75	15.57	75.96	18.56
1991	8.02	49.82	3.57	2.64	11.98	8.14	3.54	5.90	2.49	17.15	82.34	19.95
1992	10.44	52.23	4.15	3.22	13.71	9.46	4.08	6.97	2.98	21.14	87.58	22.70
1993	13.00	53.97	3.88	3.31	14.46	9.67	5.60	8.04	3.09	25.86	95.36	23.24
1994	11.43	58.05	3.98	2.98	16.85	11.22	6.05	10.01	3.62	24.89	104.85	26.05
1995	13.78	63.98	4.59	3.08	20.16	13.73	7.22	11.76	3.22	28.90	115.28	29.49
1996	14.35	66.03	4.98	3.21	22.48	13.29	8.79	13.87	3.50	31.02	122.98	30.10
1997	14.69	66.01	4.80	3.70	22.60	12.83	9.15	14.10	4.21	32.77	128.27	30.75
1998	16.34	67.23	4.83	3.42	20.41	11.19	9.88	15.07	5.08	35.30	132.51	29.93
1999	16.09		4.20	3.65		11.58	9.71		4.68	35.15	131.93	29.07
2000	16.79		3.98	4.12		12.64	10.60		4.78	36.84	138.27	30.27
Growth												
rate (%):	9.99	4.50	1.85	7.66	5.57	4.68	13.63	9.68	8.04	10.28	6.16	4.92

Table 2
Parameter Estimates of FDI, Affiliate Sales, Affiliate Employment, and Exports

Developed Countries					System Weighted R-Square: 0.7675			
	FDI		Sales		Employment		Exports	
	Parameter		Parameter		Parameter		Parameter	
Variable	Estimate	t Value	Estimate	t Value	Estimate	t Value	Estimate	t Value
Intercept	26.2260	4.15	18.6121	6.26	7.9357	3.05	-2.7874	-1.01
GDP	1.6338	10.60	1.1086	15.28	0.4150	4.74	1.1232	16.63
PC Income	-4.2476	-5.68	-1.2028	-3.42	-0.9930	-3.45	0.0966	0.29
Openness	0.9393	2.90	0.7860	5.15	0.5922	4.57	0.4108	2.89
Taxes	2.2120	7.64	0.4341	3.19	-0.0494	-0.45	1.2668	9.99
Inflation rate	0.3719	5.27	0.0619	1.86	-0.0698	-2.63	-0.0444	-1.44
Exchange rate	-3.8981	-4.80	-3.2461	-8.49	-1.0836	-3.02	0.8297	2.33
Wage rate	0.4613	2.22	0.0437	0.45	-0.1567	-2.02	-0.1696	-1.86
Interest rate	0.6490	1.11	0.2126	0.77	-0.0644	-0.29	-0.4947	-1.93
Export price	-5.6151	-4.86	-4.3607	-8.02	-1.9819	-3.94	2.3076	4.56
Agri Price	-1.8543	-1.43	-0.1589	-0.26	0.1938	0.40	-0.0036	-0.01
FDI Sales					0.7999	13.43		
Time	-0.0241	-0.48	-0.0197	-0.84	-0.0520	-2.81	0.0358	1.65
Developing Countries					System Weighted R-Square: 0.7130			
	FDI		Sales		Employment		Exports	
	Parameter		Parameter		Parameter		Parameter	
Variable	Estimate	t Value	Estimate	t Value	Estimate	t Value	Estimate	t Value
Intercept	-6.9414	-3.94	-7.2465	-6.40	2.4980	3.08	1.5886	1.61
GDP	-0.0492	-0.54	0.3564	6.12	-0.2195	-5.30	0.3053	6.01
PC Income	1.7289	6.51	1.3279	7.78	-0.2447	-1.94	0.5505	3.70
Openness	-0.4717	-1.75	0.6510	3.76	-0.6394	-5.41	0.2740	1.82
Taxes	0.0950	0.46	0.0280	0.21	-0.0520	-0.59	0.2628	2.27
Inflation rate	-0.0303	-0.48	-0.0681	-1.67	0.0556	2.04	0.0349	0.98
Exchange rate	0.2323	4.36	0.2113	6.18	-0.0267	-1.10	0.0363	1.22
Wage rate	-0.1295	-0.88	-0.0203	-0.21	-0.4630	-7.36	-0.2975	-3.60
Interest rate	-0.6641	-1.33	-0.2776	-0.86	-0.2015	-0.94	-0.0798	-0.28
Export price	1.7292	2.68	1.8701	4.52	0.0390	0.14	0.8212	2.28
Agri Price	-0.0617	-0.64	-0.0246	-0.40	0.0219	0.53	-0.0446	-0.82
FDI Sales					1.1123	26.64		
Time	0.1407	3.24	0.0632	2.27	0.0299	1.60	0.1049	4.32

Figure 1. U.S. Foreign Direct Investment in Emerging Markets, 1989-2000

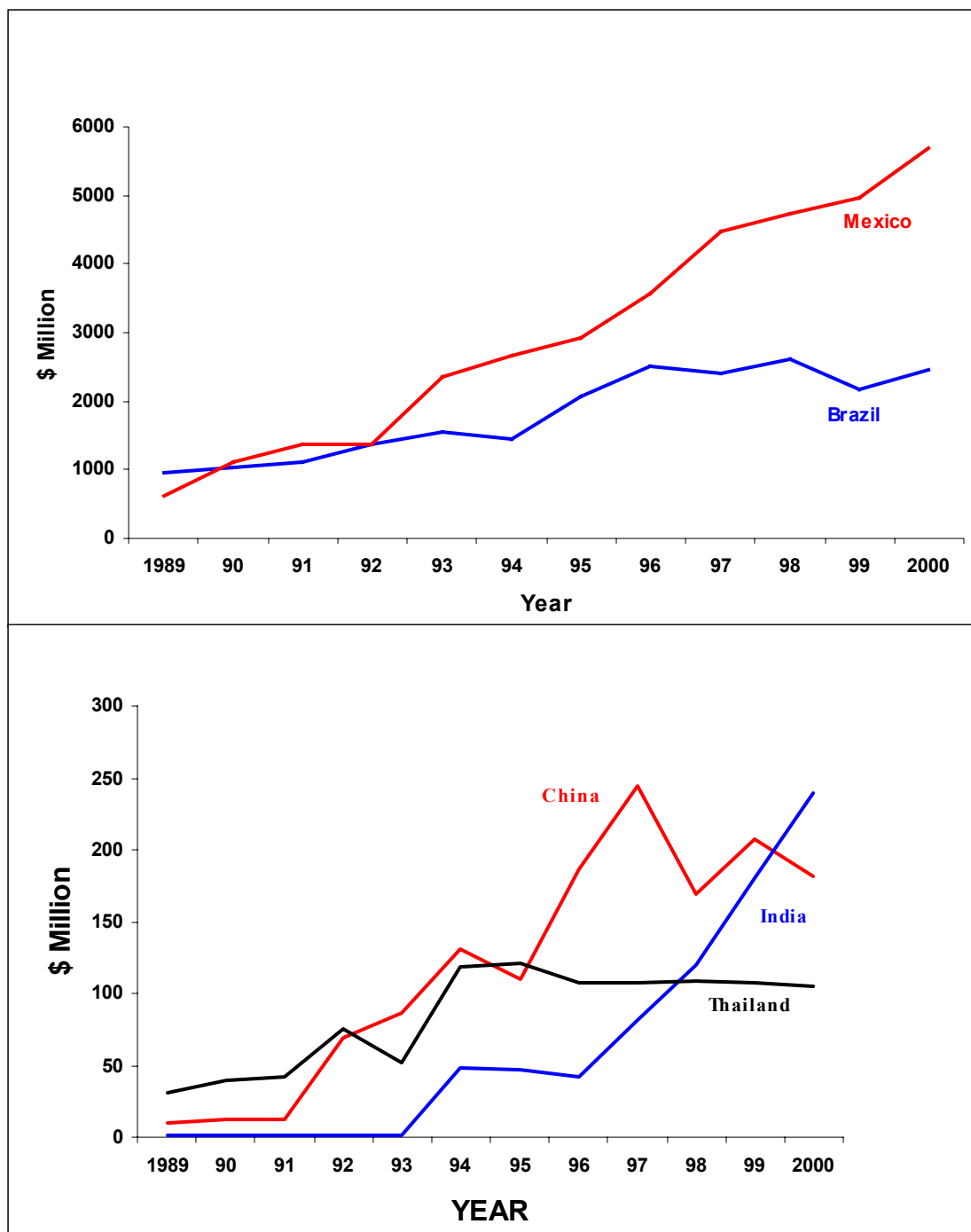
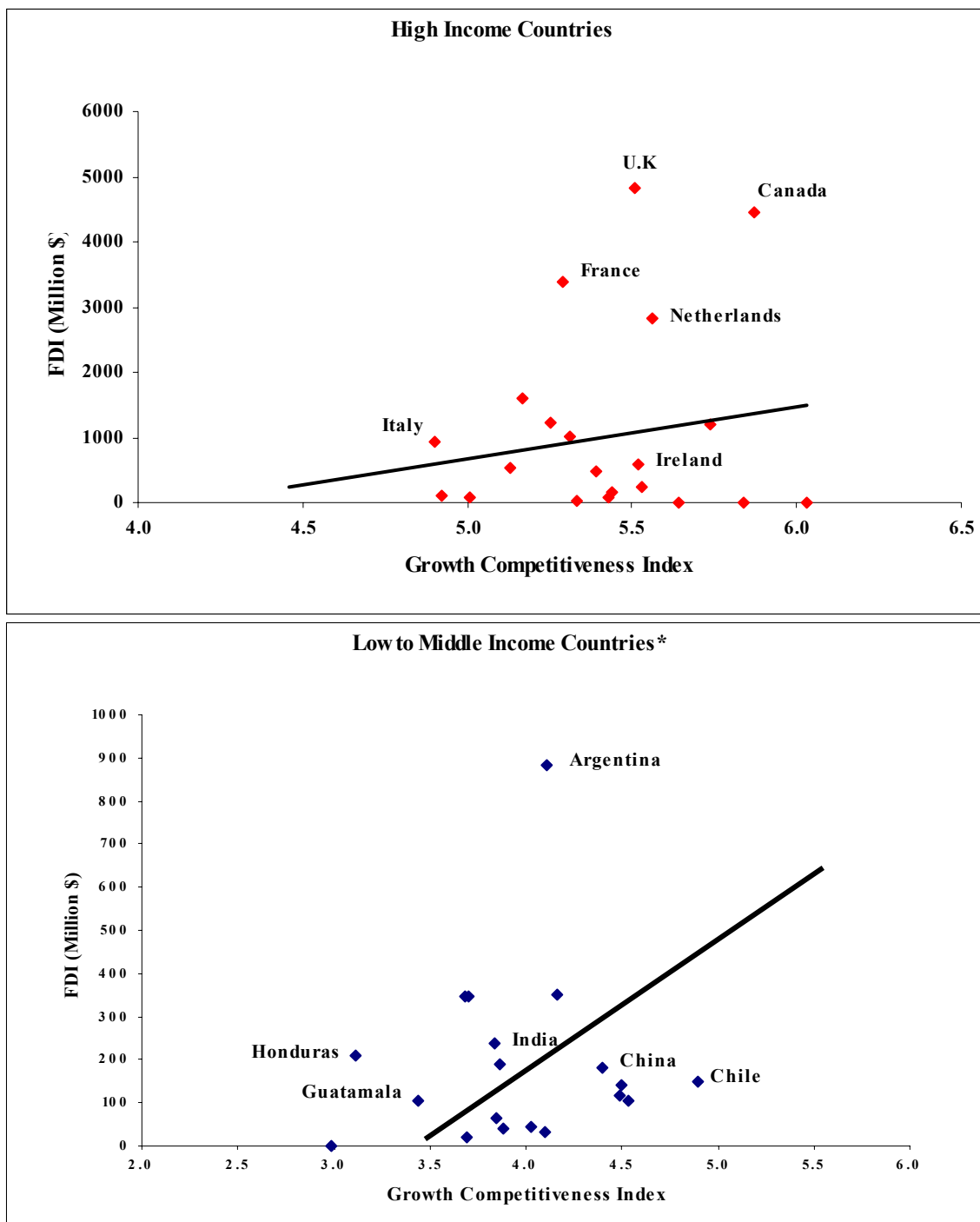


Figure 2. U.S. Foreign Direct Investment and Growth Competitive Index, Developed vs. Developing countries, 1999-2000



*Brazil and Mexico are not shown in the figure because they distort the scale on y axis