Foreign Direct Investment:
The Human Dimension

by

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Abstract

This paper explores the importance of human contact for foreign direct investment (FDI). It is hypothesized that FDI is plagued by information asymmetries and moral hazard problems, both of which can be ameliorated by human interaction. We develop a simple equilibrium model of FDI which indicates that better ability to discriminate among alternative projects in a foreign country will increase investment into that country, as well as spur more investment back from that country. We then examine the relationship between FDI and three proxies for human interaction: distance, language and travel. We find strong evidence supporting the importance of the human dimension in FDI, particularly that associated with travel. The direction of influence appears to be of travel on FDI, rather than FDI on travel.
I. Introduction

Numerous attempts have been made to explain the direction and size of foreign direct investment, FDI. Some authors have suggested that FDI is motivated by lower costs of producing abroad vis à vis producing at home and exporting to overseas markets.¹ It has also been argued that FDI may result from a desire to integrate operations and thereby assure delivery that might not be possible with arms-length transactions.² While licensing of foreign firms is an alternative to FDI, it has been suggested that some knowledge is not easily transferable, and even when it is, there is a danger of losing reputation by poor work of a licensee, or losing industrial secrets when they are in a licensee’s possession.³ These dangers favor FDI instead of licensing. It has also been argued that FDI is influenced by the exchange rate which can affect wealth, with wealth in turn being a positive influence on investment.⁴ Other explanations of FDI include a lower cost of capital of multinationals versus local firms, avoiding quotas, avoiding environmental, health and safety regulations, obtaining indirect diversification, and achieving flexibility over the location of production in the face of volatile real exchange rates and wages.⁵

In this paper we consider an element that we believe is linked to FDI: the role of personal contacts. In particular, explanations of FDI have not previously considered the role that family and/or business contacts among people could play in the decision of where and how much to

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¹ A model of FDI which considers transportation costs as well as scale economies has been developed by Lipsey and Weinblatt (1980). One cost factor favoring FDI is tariffs on products sourced from abroad, prompting production behind the tariff barrier.

² See Spitaler (1971).

³ For example, see Kindleberger (1969) and Caves (1971).


⁵ These and other explanations of FDI are surveyed in Levi (1996).
invest. If such personal contacts do play a role in international investment decisions, then it would be expected that measures of human interaction would affect the location of foreign direct investment. 6

Historical examples of the importance of human interaction in investment, trade and finance are plentiful. For example, Tamari (1987) catalogs the historical development of Jewish merchant networks that began around 70 A.D. He notes that a common language, religion and commercial and financial laws dictated by the Torah provided Jews with strong communication advantages and with shared values that encouraged mercantile and associated finance and investment activities. Shapiro (1984) notes that by the 13th and 14th centuries Jewish merchants populated, and held investments in, many Chinese cities, arriving four years before Marco Polo (Melbourne (1997)). Tamari (1987) documents the spread of Jewish mercantile activity to Europe between the 9th and 10th centuries. Of course, many of the great investment banks, such as Goldman, Sachs and Co. resulted from financing this mercantile trade.

A second example of the importance of human interaction is the spread of Chinese business networks. Redding (1990) and Reid (1996) document the migration of Chinese business from Southeast and Northeast Asian bases to virtually every OECD country in the past 150 years. As with the Jews, cultural and ethnic differences from the indigenous populations lead the Chinese to rely on close contact among their network. Again, Chinese travelers took investment from China to the rest of the world.

“Colonization” is another form that human linkages can take. For example, as the British spread their Empire to distant lands, expatriates’ links with the homeland brought investment in land, infrastructure and overseas subsidiaries of established businesses. British interests still exist in places such as Australia, Bermuda, Canada, New Zealand, the Caribbean and even in the Indian

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6 Gould (1994) examines the link between immigration and trade flows under the hypothesis that immigration creates human connections that reduce the cost of transacting between countries. He finds a positive relationship between immigration and trade. Our theoretical model focuses on the information effects of human interaction rather than cost reduction, and our empirical focus is on travel, language and distance and their relation to foreign direct investment rather than trade.
subcontinent, that date back to the original flows of people to those far-flung lands that became the Commonwealth. Similar patterns of flows of direct foreign investment following human migrations associated with colonization occurred with Spain and Portugal in Central and South America, Belgium and France in Africa and the Dutch in the East Indies.

Our paper focuses on foreign direct investment because it is based on information asymmetries between domestic and foreign investors about specific opportunities, and the ongoing need to pay close attention to the running of the overseas businesses. The information asymmetries and monitoring problems with FDI are likely more severe, but nevertheless similar in nature, to investment in stocks. Regarding stock investments, Coval and Moskowitz (1999) found that U.S. investment managers who concentrate their investment on stocks that are geographically proximate outperform equivalent-risk investments, and they outperform managers who do not focus on “close-by” stocks. Coval and Moskovitz attribute this performance to asymmetric information between local and non-local investors or to improved monitoring capabilities. Much of this outperformance seems to occur in small, highly levered firms that produce nontraded goods, which we believe supports the argument for the importance of information asymmetries and of moral hazard prevention. If such an effect is present in small-cap, but publicly traded, financial assets, we feel it is at least as likely to show up in the typically individually unique fixed asset investments made in other countries that constitute FDI.

As suggested by Coval and Moskovitz (1991), human interaction can impact investment in at least two ways. First, increased personal contact can reduce adverse selection; that is, human contacts can allow investors to better distinguish between good and bad investments. This sharper ability to discriminate will increase expected returns at each level of investment and hence encourage more investment. Second, increased personal contact after the investment is made can
reduce moral hazard; monitoring of projects is perhaps the best solution to the possible “principal-agent” conflicts induced by geographical distance between ownership and management.

We investigate three proxies for human contact. First, the physical distance between countries might act as a deterrent to real investment. This follows if distance makes project selection and monitoring more difficult. Second, language can be a barrier to human interaction. We investigate if it matters to FDI that the two involved countries share a common tongue. Third, we see if travel between two countries impacts FDI. Travel could be evidence of “before-the-fact” project investigation that allows better discrimination between competing investment projects. As well, travel could represent “after-the-fact” monitoring of fixed investments in foreign countries to help insure that expected returns are realized. Travel, whether by the investor or other people trusted by the investor such as family members, should have a positive impact on project selection and monitoring.

While the focus of this paper is the importance of personal contacts in FDI, we do not claim that the human dimension of investing is the most important determinant of FDI. In fact, we will focus on the relationship between personal contact and “abnormal” FDI. Normal FDI for a country will be defined by that country’s global FDI as a fraction of all countries’ combined global FDI, i.e., its pro rata share of global FDI. We then define abnormal FDI into, say the US, for a country as that country’s FDI into the US as a fraction of all countries’ FDI into the US, vis-à-vis the normal FDI for that country. Essentially, we try to explain the part of a country’s FDI into another that exceeds or falls short of that country’s propensity to invest globally. In other words, we ask if the human element helps explain why, for example, Japan invests more in the U.S., relative to all FDI into the U.S., than Japan invests globally relative to all countries’ global FDI.

A simple linear model which reflects the consequences of asymmetries in project-discriminating ability for domestic versus foreign investments is presented in Section II. Implications of the model are examined for variations in the quality of information on overseas
projects, the total size of investment, prospects for investment at home and restriction on the amount of investment allowed. These are described in Sections III and IV. Most of the discussion of the model and its implications is in terms of international travel as the means of improving information quality on foreign projects, but the arguments could easily apply to friendships or business relationships established by migration or commercial activities: travel is used as a convenient surrogate for describing the consequences of removal of information asymmetries. Section V presents empirical results for several factors affecting information quality using cross-sectional data. Section VI considers additional tests based on time-series data including tests of the direction of influence between travel and FDI. We show that both cross-sectional and time-series data for FDI in and out of the United States provide solid support for the arguments in the paper. Section VII offers conclusions and suggestions for further research.

II. The Human Dimension of FDI

We consider a two-country world in which residents of each country face a continuous set of possible projects at home and abroad. Projects are risky with actual returns unknown, but investors can rank projects according to expected returns. There are several aspects of the ability to rank or discriminate between projects that we wish to capture. One of these is that investors can discriminate between alternative projects at home better than they can discriminate between projects abroad: they are “shooting in the dark” by a larger extent in a foreign country. A second characteristic is that investors know about their better discriminating ability and those of fellow countrymen in the home country, and adjust marginal expected returns accordingly: a given amount of investment by locals reduces expected marginal returns on remaining investment projects by more than if the investment is by foreigners. While locals and foreigners cannot perfectly rank projects, locals can do a better job. Knowledge that locals discriminate between projects better than foreigners is symmetrical.
Human interaction, say in the form of international travel, is assumed to improve the quality of information about specific investments. In principle, information on an overseas project may be improved for the traveller or for others who trust and receive information first hand from the traveller. For example, when somebody travels from Hong Kong to Australia, information on possible real estate or business investments in Australia is improved for the traveller as well as relatives or friends in Hong Kong. Such an improvement in specific information may simply result from greater ease in finding out, for example, what plans exist for adjoining and other nearby properties to a potential investment location, whether a retail business or residential property is in an up-and-coming area, and so on. Without travelling or learning from somebody who does, information about specific investments may be difficult to verify; those who travel or know people who travel can discriminate between alternative opportunities better than others.

A simple, linear model that allows us to capture the aforementioned characteristics, and to evaluate the effects of travel and other activities affecting international information flows, is:

\[
\begin{align*}
    r_{11} &= a_1 - b_1 I_{11} - c_1 I_{21} \\
    r_{22} &= a_2 - b_2 I_{22} - c_2 I_{12} \\
    r_{12} &= a_1 - \delta_1 I_{12} - \varepsilon_1 I_{12} \\
    r_{21} &= a_2 - \delta_2 I_{11} - \varepsilon_2 I_{21}
\end{align*}
\]

where

\( r_{ij} = \text{marginal expected return of resident of country } i \text{ from investing in country } j; \ i, j=1,2 \)

\( I_{ij} = \text{amount invested by residents of country } i \text{ in country } j; \ i, j=1,2 \)

The investments \( I_{ij} \) are FDI positions, i.e. stocks, and hence we can think of \( r_{ij} \) as the expected marginal efficiency of capital for a given source country and destination country. For simplicity, we take total amounts invested by residents of each country to be given, i.e.\(^7\)

\[
I_{11} = \hat{I}_1 - I_{12} \text{ and } I_{22} = \hat{I}_2 - I_{21},
\]

where \( \hat{I}_i = \text{given amount invested by residents of country } i \text{ in country } i \text{ plus country } j. \)
The assumptions about investors’ discriminating abilities between projects at home versus abroad, their perceptions of each others’ discriminating abilities and so on, can be captured in the ranking of slope and intercept parameters in the expected marginal return functions and will be discussed in the context of the comparative static implications of the model.

We assume investors from each country choose to invest at home versus abroad until expected marginal returns from domestic projects equal expected marginal returns from foreign projects, i.e.\(^8\)

\[ r_{11} = r_{12} \text{ and } r_{22} = r_{21} \quad (3) \]

Substituting from (1) and (2) into (3)

\[ (b_1 + \varepsilon_1)I_{12} - (c_1 + \delta_1)I_{21} = a_{12} - a_1 + b_1 \hat{I}_1 - \delta_1 \hat{I}_2 \]

and

\[ (c_2 + \delta_2)I_{12} - (b_2 + \varepsilon_2)I_{21} = a_2 - a_{21} + \delta_2 \hat{I}_1 - b_2 \hat{I}_2 \quad (4) \]

We can write this as

\[
\begin{bmatrix}
(b_1 + \varepsilon_1) - (c_1 + \delta_1) \\
(c_2 + \delta_2) - (b_2 + \varepsilon_2)
\end{bmatrix}
\begin{bmatrix}
I_{12} \\
I_{21}
\end{bmatrix}
= \begin{bmatrix}
a_{12} - a_1 + b_1 \hat{I}_1 - \delta_1 \hat{I}_2 \\
a_2 - a_{21} + \delta_2 \hat{I}_1 - b_2 \hat{I}_2
\end{bmatrix}
= \begin{bmatrix}
Q_{12} \\
Q_{21}
\end{bmatrix}
\]

where

\[ Q_{12} = a_{12} - a_1 + b_1 \hat{I}_1 - \delta_1 \hat{I}_2 \]

and

\[ Q_{21} = a_2 - a_{21} + \delta_2 \hat{I}_1 - b_2 \hat{I}_2 \]

Applying Cramer’s rule to solve for the equilibrium international investments denoted by *:

\[
I_{12}^* = \frac{1}{D} \left| \begin{array}{c} Q_{12} - (c_1 + \delta_1) \\ Q_{21} - (b_2 + \varepsilon_2) \end{array} \right| = \frac{Q_{21}(c_1 + \delta_1) - Q_{12}(b_2 + \varepsilon_2)}{D} \quad (5)
\]

\(^7\) Later we consider the effects of changing total amounts invested.

\(^8\) Condition (3) results from each country choosing its FDI, subject to its budget constraint, to maximize the sum of the areas under the marginal expected return functions. This objective is convex for many parameterizations, including those given in condition (7) below.
\[
I'_{12} = \frac{1}{D} \begin{vmatrix} b_1 + \epsilon_1 & Q_{12} \\ c_2 + \delta_2 & Q_{21} \end{vmatrix} = \frac{Q_{21}(b_1 + \epsilon_1) - Q_{12}(c_2 + \delta_2)}{D}
\]

(6)

where \( D = (c_1 + \delta_1)(c_2 + \delta_2) - (b_1 + \epsilon_1)(b_2 + \epsilon_2) \)

Before performing any comparative statics, we can consider the implications of parameter values in (1) which follow from our assumed structure of investors’ discriminating ability differences between domestic and foreign investments, and symmetrical knowledge about these discriminating abilities.

A sufficient condition for \( D > 0 \) is:

\[ b_j = \delta_j > c_j > \epsilon_j \]  

(7)

The assumption in (7) that \( b_j = \delta_j \) follows if countries are alike in terms of how quickly expected returns decline as investment expands, and hence projects are removed from the project set as they are selected/pursued by the better informed investors, namely, domestic investors. That is, \( b_j = \delta_j \) if the marginal efficiency of capital schedules facing investors from a given country have the same slope from increased investment by local, informed investors. For the purpose of the comparative statics in what follows, we shall maintain this assumption even though it may be necessary to modify the nature of investment magnitudes if we are considering countries of very different size.

The assumption in (7) that \( b_j = \delta_j > c_j \) captures the view that investors realize that they and fellow locals can discriminate better between alternative domestic investments than can foreign investors; further investment by foreigners has less impact on domestic investors’ expected returns than does the same amount of further investment by themselves or fellow locals; local investors, by picking what, on average, will turn out to be better projects than foreign
investors, force down expected returns on remaining projects by more than foreigners.  

The assumption in (7) that \( c_j > \varepsilon_j \) is based on the view that a better ability to rank domestic investment projects means domestic investors can resort and rank remaining investments at home better than they can resort and rank remaining projects abroad. When foreigners invest, local investors know relatively more about the quality of the selected investments that are removed from the set of projects from which domestic investors must choose. The fact that overseas investments are relatively poorly selected means that expected marginal returns to local investors are affected relatively little by additional overseas investment. For example, suppose foreign investments are entirely random, and this is known by investors. Then more investment by foreigners has no effect on what foreigners expect to earn on further investment, i.e. \( \varepsilon_i = 0 \); all projects offer the mean return. However, because local investors can rank domestic projects very well, and delete from the remaining set those projects they would have selected themselves but which, purely by chance, were chosen by foreigners, expected returns on domestic investments are reduced.

In order to sign \( Q_{12} \) and \( Q_{21} \), we assume \( \hat{I}_1 = \hat{I}_2 \) so that comparative statics can be performed. We also need to sign \((a_{12} - a_1)\) and \((a_2 - a_{21})\). The value of \( a_i \) is the highest expected return - the highest marginal efficiency of capital - facing a domestic investor. With an ability to discriminate between projects, this highest expected return is substantially higher than the average expected return. On the other hand, \( a_{ij} \) is the highest expected return on foreign projects. With poor discriminating ability, this will be much closer to the average expected return. Indeed, with

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9 Investors are not assumed to know the marginal efficiency of investment schedules or even which investors are domestic and foreign. Rather, they examine the remaining set of projects available to them at any time. Expected returns adjust because of the changing quality of projects remaining in the set.
no discriminating ability, $a_{ij}$ is the average expected return facing foreign investors: all selections are random. The interpretation of $a_{i}$ and $a_{ij}$ immediately suggest

$$a_2 > a_{21} \text{ and } a_1 > a_{12}$$

The combined assumptions

$$b_i = \delta_i > c_i > \varepsilon_i$$

$$\overline{P}_1 = \overline{P}_2$$

and

$$a_2 > a_{21}$$

$$a_1 > a_{12}$$

imply $D > 0$, $Q_{12} < 0 < Q_{21}$, and from (5) and (6) that $I_{12}^*, I_{21}^* > 0$.

That is, the model provides foreign direct investment in both directions.

Figure 1 gives a geometrical interpretation of the solutions for $I_{12}^*$ and $I_{21}^*$, and hence for given $\hat{I}_1$ and $\hat{I}_2$, also the solutions for $I_{11}^*$ and $I_{22}^*$. The schedules sloping down from left to right in the two figures give expected marginal efficiencies of capital, MECs, from domestic investments. They have slopes of $-b_i$ and intercepts drawn for the solutions of $I_{ij}^*$ for $i \neq j$. The schedules sloping down from right to left give the expected MECs from investments in the foreign country measured from right to left along the horizontal axis. The intercepts, which are drawn for the solutions for domestic investment, give the highest expected returns from the sets of possible foreign investments.

We have drawn the figure with the schedule of expected MECs from domestic investments having a larger slope than foreign investments due to the better ability to discriminate among domestic projects. We also show higher intercepts on the domestic schedule of expected MECs: again, better discriminating ability means the first domestic project to be accepted has a higher expected return than the first foreign project. The equilibrium with $r_{i1} = r_{12}$ and $r_{22} = r_{21}$
is shown for given total amounts being invested. This is the optimum allocation that is disturbed by changes in slopes or positions of the MEC schedules. All schedules are drawn for the solution values in the other part of the figure, so that the top figure assumes the solution to the lower figure, and vice versa.

III. Effects of Improved Ability to Choose Foreign Projects

As we have mentioned, the ability to discriminate between alternative projects affects the slope of the schedule representing expected returns on incremental investment projects. For example, the better is the ability of country 1's residents to discriminate between alternative projects in country 2, the higher is $\varepsilon_1$ which reflects how rapidly $r_{12}$ declines as $I_{12}$ expands. Such an increase in $\varepsilon_1$ could result from travel from 1 to 2 with travelers learning about the projects themselves, or by travelers conveying back credible information. We can determine the effects of increasing $\varepsilon_1$ by considering the solution to (4):

\[
(b_1 + \varepsilon_1)I_{12}^* - (c_1 + \delta_1)I_{21}^* = (a_{12} - a_1) + b_1 \hat{I}_1 - \delta_1 \hat{I}_2
\]

\[
(c_2 + \delta_2)I_{12}^* - (b_2 + \varepsilon_2)I_{21}^* = (a_2 - a_{21}) + \delta_2 \hat{I}_1 - b_2 \hat{I}_2
\]  

With better discriminating ability of residents of 1 in 2 the value of $\varepsilon_1$ is increased by $d\varepsilon_1$, and (8) becomes:

\[
I_{12}^* d\varepsilon_1 + (b_1 + \varepsilon_1) dI_{12}^* - (c_1 + \delta_1) dI_{21}^* = 0
\]

\[
(c_2 + \delta_2) dI_{12}^* - (b_2 + \varepsilon_2) dI_{21}^* = 0
\]

\[
I_{21}^* = \frac{c_2 + \delta_2}{b_2 + \varepsilon_2} dI_{12}^*
\]  

which from (9) gives:
\[ I_{12}^* d\epsilon_1 + (b_1 + \epsilon_1) dI_{12}^* - (c_1 + \delta_1) \frac{c_2 + \delta_2}{b_2 + \epsilon_2} dI_{12}^* = 0 \]

i.e.

\[
\left[ (c_1 + \delta_1) \frac{c_2 + \delta_2}{b_2 + \epsilon_2} - (b_1 + \epsilon_1) \right] dI_{12}^* = I_{12}^* d\epsilon_1
\]

The bracketed term is positive since \( b_1 = \delta_1 \) and \( c_1 > \epsilon_1 \). Therefore, \( dI_{12}^* > 0 \) for \( d\epsilon_1 > 0 \).

Further, from (11) and \( b_2 = \delta_2 > c_2 > \epsilon_2 \),

\[ dI_{21}^* > dI_{12}^* > 0 \]

We find that if residents of 1 enjoy an improvement in their ability to discriminate between projects in 2, they will place more of their investment in 2. The greater investment of country 1 in country 2, and the improved project selection, \( ceteris paribus \) reduces expected returns of residents of country 2 in their home country. This causes residents of country 2 to invest more in country 1, and consequently to invest less at home. Indeed, the extra investment of 2's residents in country 1 exceeds the extra investment of country 1's residents in 2. What happens is that expected returns of residents of country 1 in country 1 must be increased enough to match their better expected returns in 2 resulting from their assumed improved overseas discriminating ability. This requires that a greater proportion of investment in 1 be by residents of 2, with their poorer discriminating ability. Also, residents of country 2 must have returns equalized to maintain equilibrium. More FDI moves from 2 to 1 versus 1 to 2 because residents of 2 do not know more about projects in 1, whereas residents of 1 do know more about projects in 2, by assumption.
IV. Further Model Perturbations

A. Effect of Greater Total Investment

While our primary interest in this paper is the relationship between access to overseas alternative project information and FDI described in the preceding section, we can check to see if the model yields reasonable implications along other lines. We employ the same total derivative technique on equations (8) as we did above in the following comparative statics investigations.

First, since our empirical evaluation later on relates to size of investments as well as the ability to discriminate between projects, consider the effect of changing total investment.

For a change in $\hat{I}_1$, we calculate

$$dI_{12}^* = \frac{1}{D} [\varepsilon_1 - a_1 \varepsilon_2] d\hat{I}_1 > 0$$

$$dI_{21}^* = \frac{1}{D} [\varepsilon_2 - a_2 \varepsilon_1] d\hat{I}_1 < 0$$

We find that more total investment by residents of country 1 increases their investment abroad and reduces foreign investment in country 1: with total investment by country 2 unchanged by assumption they are keeping more funds at home.

B. Improved Investment Climate at Home

Investment abroad will be affected by opportunities at home at all levels of human contact facilitated by travel or other forms of personal contact. In order to determine the effect of domestic investment opportunities, consider an increase in $a_1$, the highest expected project return in country 1 facing domestic investors. For a given slope, this means an overall improved investment climate: the entire downward-sloping schedule in Figure 1 is shifted up. We have

$$dI_{12}^* = \frac{1}{D} \left[ -a_1 \varepsilon_1 - (c_1 + \delta_1) \right] = \frac{b_2 + \varepsilon_2}{D} a_1 > 0$$
We find that an improved investment climate in country 1 increases overseas investment in both directions. This result is driven by the equilibrium requirement that for residents of country 1, returns in country 2, at the margin, must equal those at home. This requires that 2’s residents invest less in 2, thereby driving up 1’s expected returns in 2. With 2’s residents investing less in 2, they invest more in 1, something they are willing to do because of higher returns caused by country 1 investors investing more in 2.

C. Effect of Foreign Investment Restrictions

Limits on the amount of investment that can be made outside the investor’s own country, and limits on the amount foreigners can invest in a country, can both limit the amount of foreign direct investment. Let us consider a restriction on how much residents of 1 can invest in 2.

A binding restriction on the amount of FDI that residents of 1 can invest in 2 can be considered as a reduction in \( I_{12}^* \) by \( dI_{12}^* < 0 \). With total investment by residents of 1 unchanged:

\[
\frac{di_{11}^*}{di_{21}^*} = \frac{b_2 + \varepsilon_2}{c_2 + \delta_2} < 1
\]

What does the restriction on residents of country 1 imply for the equilibrium amount that residents of country 2 invest in 1? To determine this, note that if country 2 residents are not restricted, then for them

\[
r_{21} = r_{22}
\]

and so from the definitions in (1) at optimal amounts of investment

\[
a_{21} - \delta_2 I_{11}^* - \varepsilon_2 I_{21}^* = a_2 - b_2 \hat{I}_2 + b_2 I_{21}^* - c_2 I_{12}^*
\]

i.e. for changes caused by the restriction
Using (12) \[ (c_2 + \delta_2)dl_{12}^* = (b_2 + \varepsilon_2)dl_{21}^* \]

or \[ dl_{21}^* = \frac{c_2 + \delta_2}{b_2 + \varepsilon_2} dl_{12}^* \]

With \( b_2 = \delta_2 > c_2 > \varepsilon_2 \) as in (7) we find that

\[ \frac{dl_{21}^*}{dl_{12}^*} > 1 \]

i.e. when country 1 is restricted in investment in 2 there is a bigger reduction in 2's investment in 1. This is because 2 earns more at home when 1 is restricted from investing in 2. The relative discriminating abilities causes the size of the reaction as with our preceding comparative statics.

V. Measuring the Impact of Access to Project Information on FDI

Our focus is on testing the implication of our model that better access to project information means more FDI into one country from another. By “access to project information” we mean: (i) better information about the distribution of expected returns along the schedule of available investments, when making the investments, and (ii) better ability to monitor and operate the projects efficiently once the investment is made.

We are not attempting to explain the level of FDI from one country into another. As the literature cited in the introduction explains, this depends upon many factors, in both the source country and destination country. We will take as given, for example, the amount of FDI from Sweden to other countries. We will measure Sweden’s “propensity for FDI” as its FDI in all other countries, divided by the sum of all countries’ FDI in all other countries (the sum of the “propensity” across countries thus adds up to one). Then, our interest is in understanding the
proportion of Sweden’s FDI into a particular country, specifically the United States, as a proportion of all countries’ FDI in the U.S. (this “propensity for FDI in the U.S. adds up, when summed across countries, to one). We say that Sweden invests a disproportionately large amount in the U.S. if the proportion of U.S. investment coming from Sweden is larger than Sweden’s share of FDI in the world. For example, if Sweden is responsible for 2 percent of FDI into the U.S. but 1 percent of world FDI, then it is a disproportionately large U.S. investor. Our purpose is then to investigate whether better access by a country to project information in the U.S. through travel or other means is a possible reason for a larger propensity to invest in the U.S. by that country.

After explaining foreign FDI into the US, we then consider whether the amount of FDI from the U.S. into other countries depends upon information about those foreign countries’ projects by U.S. investors. Since we are then dealing with FDI from only one country, we need not standardize into a “propensity” as we did above. Thus, we attempt to understand the amount of FDI from the U.S. into other countries using proxies for U.S. investors’ information about those foreign investments.

The most detailed data on FDI are available for the United States. The Bureau of Economic Analysis of the U.S. Department of Commerce maintains, under the heading of “International Investment Data”, the FDI positions of over fifty foreign countries in the U.S., and also the FDI position of the U.S. in these foreign countries. Annual data are available by country only on an historical-cost basis, but since all countries are treated in the same way, there should be no obvious systematic biases vis à vis market-value data. When looking at the “stock” of FDI (as opposed to FDI flow, or changes), we use the FDI data for the year 1999 from the Bureau’s

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10 Time series data of FDI positions on a historical basis can differ substantially from market value data due to differences in timing of investment with trended data. For example, if U.S. FDI abroad occurred generally in earlier years than FDI in the United States, the net position of the U.S. will be understated by the extent market-values exceed historical-cost values. By using a single year in our cross-sectional estimates, distortions in the data we use arise only to the extent different countries invested earlier or later, with no systematic bias like that present in time series.
To determine the effect of information about possible projects on the amount of FDI coming from a particular country, while avoiding the effects of scale (large countries invest more and receive more FDI), we employ a two-step estimation procedure for FDI into the United States. First, we estimate

\[
\frac{\text{FDI}_{i,\text{us}}}{\sum_j \text{FDI}_{j,\text{us}}} = a \frac{\text{FDI}_{i,*}}{\sum_j \text{FDI}_{j,*}} + e_i \tag{13}
\]

where \( \text{FDI}_{i,\text{us}} \) = FDI position of country \( i \) in the U.S. and \( \text{FDI}_{i,*} \) = FDI position of country \( i \) in the world.

The dependent variable in (13), the “propensity” of country \( i \) to invest in FDI, measures the importance of country \( i \) in the total FDI by all countries in the United States. The regressor measures the importance of country \( i \)'s FDI worldwide relative to the worldwide FDI position of all the countries combined. We can interpret the residual term, \( e_i \), as the “abnormal” amount of FDI by country \( i \) in the United States relative to what we would expect given the importance of \( i \) in the FDI of the world. Countries with relatively large FDI in the U.S. via \( \text{à vis} \) their worldwide FDI will have a positive residual. Our objective is to explain this abnormal FDI in terms of the relative quality of \( i \)'s information on possible U.S. projects. That is, we explain the residual in (13), the abnormal amount of FDI. The normal amount which we take as given will depend on numerous other factors including those described in the introduction.

In the estimation of (13) we obtain the FDI position of country \( i \) in the world from the 2000 World Investment Report: Investment, Trade and International Policy Arrangements. As with the FDI in the United States, the worldwide FDI data are for the year 1999. The World Investment Report is published by the United Nations Center on Transnational Corporations.

The residuals obtained from Equation (13) are shown in Table 1. The countries with the biggest positive residuals are Japan (7.2%), the Netherlands and Canada. Japan’s FDI in the U.S.
is well-known, and the intermingling of Canada’s economy with the U.S. is also understood. The Netherland’s “abnormal” FDI in the U.S. may be related to the presence there of large multinationals like Phillips and Shell. Hong Kong, Italy and Spain have FDI that is much less than indicated by their proportions of world FDI. Hong Kong invests in many countries, especially China, and the European countries have much of their FDI in other European countries.

Having obtained the residuals from equation (13), we explain these abnormal FDI’s in the United States in terms of variables which should be proxies for the relative ability of country \( i \)’s investors to judge the quality of U.S. projects.

Note that this two-step regression procedure is not necessary, and we use it only to exhibit the residuals from the first stage to show which countries have positive or negative “abnormal” FDIs. All the results we obtain from such a two-step procedure are very similar if we do one regression with the same dependent variable, but include our other explanatory variables on the right-hand side of equation (13). Results are given below for the one- and two-step estimation procedures.

We have selected three proxies for foreigners’ access to information about projects in the U.S. (or, subsequently, for U.S. investors making FDI in foreign countries). Our first measure of relative ability to discriminate between U.S. investment projects is the relative amount of travel to the U.S. coming from country \( i \). That is, as in (14) below, we have as a determinant of abnormal FDI in the U.S. from \( i \), the “propensity” to travel to the U.S. from \( i \). Similar to the “propensity” measures of FDI above, we divide our measure of travel from country \( i \) to the U.S. by the sum of all countries’ travel to the US. Hence we investigate how ‘abnormal’ FDI is related to abnormal amounts of travel. Again, when we later reverse the direction and look at travel from the U.S. to country \( i \) versus U.S. FDI in \( i \), no such adjustment is required. We define \( Travel_{i,us} \) as the number of person-visits to the U.S. from country \( i \). Specifically, we use International Arrivals to the U.S. by Country of Residence, published by the International Travel Agency. We take an average from 1996-99. The same source provides U.S. Residents’ Travel to Overseas Countries,
used later.

We believe travel to the U.S. benefits foreign investors in accessing project and operation information. It benefits foreign investors by giving them “on the ground” information about a project that they can’t see from home; this allows better estimates of expected returns. As well, after the investment is made, monitoring (to reduce moral hazard and other principal-agent problems) allows expected returns to be better realized. Thus we expect a positive coefficient on the travel variable.

Our second regressor is a dummy variable representing whether country \( i \) is an English-speaking country. Understanding projects and monitoring their operation may be simpler without the need for translation among the parties involved. Thus, we would expect a positive coefficient on the language dummy, \( L_i \).

Finally, distance, \( D_i \), may be a determinant of abnormal investment. The proximity of Canada and Mexico, for example, could lead to more FDI from those countries into the U.S. than they undertake in other foreign countries. Our distance measure was constructed by Keith Head and consists of the “great-circle” distance between the major cities of pairs of countries, based upon their latitude and longitude.\(^{11}\)

Thus, equation (14) below is used to investigate our model’s implication that better access to project information by foreigners increases their investment in the US:

\[
e_i = \beta_0 + \beta_1 \frac{\sum_j \text{Travel}_{i,us}}{\text{Travel}_{j,us}} + \beta_2 L_i + \beta_3 D_i + u_i
\]  

(14)

Tables 2 and 3 contain the results of regressing countries proclivity to FDI in the US, using 1999 FDI levels, either in a two-stage regression procedure (Table 2) or in a single regression equation (Table 3). Language and distance have insignificant coefficients. However, the propensity for travel from the country to the US, measured as the average travel in 1996-99
has a significant positive relationship with FDI in the US. This is evidence that FDI is enhanced by human interaction, either in project discovery before the investment or in project monitoring after the investment.

As well as foreign FDI in the US., the Bureau of Economic Analysis also provides data on FDI by U.S. residents in foreign countries. We located FDI data for U.S. FDI into the following countries (English-speaking countries identified): Argentina, Australia (English), Austria, Bahamas, Belgium, Brazil, Canada (English), Chile, China, Colombia, Czech Republic, Denmark, Egypt, Finland, France, Germany, Greece, Hong Kong, Hungary, India, Indonesia, Ireland (English), Israel, Italy, Jamaica, Japan, Republic of Korea, Malaysia, Mexico, Morocco, Netherlands, New Zealand (English), Norway, Peru, Philippines, Poland, Portugal, Singapore, South Africa, Spain, Sweden, Switzerland, Taiwan, Thailand, Turkey, United Kingdom (English), Venezuela and Vietnam.

In the case of U.S. FDI abroad there is no need to normalize by the total size of a country’s FDI as we did when considering FDI into the United States: we are considering one country’s FDI, not a variety of countries of widely ranging different total FDI’s. Therefore, rather than use a two step procedure, we estimate (15) below:

$$\sum_j \frac{FDI_{ax,j}}{FDI_{ax,i}} = \beta_0 + \beta_1 \sum_j \frac{Travel_{ax,j}}{Travel_{ax,i}} + \beta_2 L_i + \beta_3 D_i + u_i$$

(15)

The results of regression (15) are shown in Table 4. The significant positive coefficient on the propensity to travel by U.S. residents to foreign countries indicates that travel is related to the amount of FDI in foreign countries. In addition, language is now also a significant factor: U.S. residents invest more in countries in which there is a common language. We interpret these results as support for the role of the human element in investment. Interpersonal contact, as proxied by

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travel and the importance of a common language in U.S. FDI, has a significant positive relationship to the amount of investment.\(^{12}\)

We have done several robustness checks. First, we have replicated the above tests using the difference in annual FDI stocks, as an approximation of the flow of FDI. We used the average change in the level of FDI from 1996 to 1999 as the measure of investment. This makes the construction of the investment variable consistent with the travel variable constructed over the same time interval. The results are unchanged with this approximation of FDI flow rather than levels. We have also omitted Canada and Mexico because their close proximity might bias the result. Again the results are unchanged.

In order to check for simultaneous equation bias due to FDI affecting travel and travel affecting FDI, we performed two validation checks. First, we omitted the contemporaneous 1999 travel to the US, using average travel in 1996-98.\(^{13}\) Table 5 shows that travel to the U.S. remains a significantly positive influence on “abnormal” FDI into the US., and language and distance remain insignificant. Second we selected several instruments for travel and performed two-stage least squares. Instruments for travel include distance, which should be negatively related, Purchasing Power Parity, PPP, deviations based on Penn Tables values where undervaluation vis-à-vis PPP should encourage more travel, and lagged travel.\(^{14}\) With all combinations of these instruments travel remained statistically significant, and distance and language insignificant.

We interpret Tables 2 through 5 as evidence in support of the importance of the human element in allowing access to project information that is crucial in foreign direct investment. Travel of foreigners to the US, and U.S. residents to foreign countries, is important in allowing investors to better understand, and monitor, projects they choose for FDI. While foreigners do not

\(^{12}\) Bhattacharya and Groznik (2001) find that total U.S. FDI into a country is affected by the total income of the immigration population from that country. As in our paper, distance does not affect U.S. investment. In addition, language does not affect investment, unlike our result. However, they do not consider travel as a determinant of FDI.

\(^{13}\) We also considered the average for 1995-97. Results are essentially the same as those in Table 5.

\(^{14}\) Penn World Table data, were obtained from the University of Toronto data base at http://datacentre2.chass.utoronto.ca.
VI. Causation and Tests of Implications: Time Series Data and Results

Quarterly data on the flow of FDI into and out of the United States, by country, are available from the second quarter of 1952 to the present. They are contained in the flows of funds accounts which are provided by the Federal Reserve Board. Quarterly data on travel are available only up to the fourth quarter of 1993. Having an extended time series of data allows us to further examine the relationship between human interaction and FDI. We can investigate how personal interaction improves information access. We have speculated about two ways. First, personal interaction allows the investor to better estimate expected project returns before investing. In our model, this was interpreted as meaning the foreign investor was better able to discriminate among projects. However, a second interpretation provides the same relationship between human interaction and FDI. Namely, once a project is undertaken, personal interaction allows the amelioration of moral hazard, or “principal-agent” conflicts, thereby improving project returns. While both these arguments lead to the same conclusion in our model (more human interaction means more FDI), one story is about “before the fact” human interaction and the other is about “after the fact” interaction.

Using our quarterly time series of travel and FDI flows, we have run Granger causality tests to see if travel, our proxy for interaction, Granger-causes FDI (the “before-the-fact” story) or whether FDI Granger-causes human interaction. Table 6 shows the results, which are all based on a four-quarter lag.

The F-statistics in Table 6 indicate rejection of the nulls, shown there, at the 5% probability level. This means that it is likely that both adverse selection (“before-the-fact” project
information access) and moral hazard (“after-the-fact” project information access) play a role in linking human interaction with FDI.

Access to this long time series of quarterly data also allows us to examine a second implication of our model. Perhaps the strongest implication from the comparative statics of our simple linear model is that more FDI into a country causes FDI to flow out, and that the amount flowing out will exceed the amount of FDI coming in. This conclusion follows from (11), i.e.

\[ \frac{dI^*_2}{dt} = \frac{\delta_2 + \frac{b_2}{c_2}}{b_2 + c_2} dI^*_1 \]

and \( b_2 = \delta_2 > c_2 > \epsilon_2 \). The logic is that more must flow out to reduce marginal returns in the second country by enough to restore equilibrium because the outflow involves poorer discrimination between alternative projects than inflows. In order to test our implication that \( dI^*_2 > dI^*_1 > 0 \) we estimated (16)

\[ FDI_{US,t} = \beta_0 + \beta_1 FDI_{US,t}^* + e_t \]

where \( FDI_{US,t}^* = FDI \) flow from U.S. to rest of the world during calendar quarter \( t \).

The results of estimating (16) over the period 1952:1 - 1999:2 are shown in Table 7.15. Not only is the association very close, as we would expect in a long time series with variables that grow, but the coefficient on FDI exceeds 1.0. Indeed, the “t” value for the two-tailed test that the coefficient on FDI inbound into the U.S. is different from unity is 10.4411. Every extra dollar of FDI entering the United States is associated with an additional $1.21 leaving, with this latter amount being significantly greater than one statistically.

VII. Conclusion
The premise of this paper is that personal contact affects foreign direct investment (FDI). We believe that human contact between investors and people in host countries improves investment in at least two ways. First, it reduces the information asymmetry between foreign and domestic investments. Second, human interaction reduces moral hazard; after a project has been initiated, investors can reduce the principal-agent problem.

We are not attempting to explain the level of FDI from one country to another. The literature contains many studies of the determinants of FDI. We are investigating the marginal impact of human interaction on that investment. Thus, we look at FDI, for example, from country \( i \) into the US, as a proportion of all FDI into the US. We take “normal” FDI to be that part of this FDI ratio that is explained by country \( I \)’s total FDI as a fraction of all countries’ world FDI. We examine the link between the “abnormal” FDI and human interaction.

We look at three proxies we feel are related to information about foreign investment opportunities. A common language is perceived to increase human interaction, as is proximity to the investment. In addition, travel between two countries is taken as a measure of the amount of human interaction.

The results are statistically compelling: travel from a foreign country to the U.S. is strongly positively related to that country’s FDI in the US. As well, foreign travel by U.S. residents to a foreign country is strongly positively related to U.S. FDI into that country. In addition, U.S. FDI into foreign countries is greater if the foreign country has English as its mother tongue. Distance, on the other hand, seems less relevant.

A further implication of our model is that when increased human interaction leads country 1 to invest more in country 2, the equilibrium requirement that marginal expected returns equilibrate for investors in each country implies that country 2 should increase its investment in country 1 by even more than 1’s increase in 2. We test this implication with a long time series of

---

15 We can lengthen the ending date of the sample because we are not using travel data.
FDI flows into and out of the US. We find that, on average, a $1 increase in FDI into the U.S. causes an FDI outflow from the U.S. of $1.21, as the theory predicts.

We believe that there is a significant human dimension to investment that has been shown in several contexts, including investment in financial assets. We add to this the evidence of a human dimension in foreign direct investment.
REFERENCES


**Table 1: Residuals from equation (13)**

<table>
<thead>
<tr>
<th>Country</th>
<th>Residuals (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Argentina</td>
<td>-0.335</td>
</tr>
<tr>
<td>Australia</td>
<td>-0.382</td>
</tr>
<tr>
<td>Austria</td>
<td>-0.058</td>
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<tr>
<td>Bahamas</td>
<td>0.451</td>
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<tr>
<td>Bahrain</td>
<td>0.194</td>
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<tr>
<td>Barbados</td>
<td>0.483</td>
</tr>
<tr>
<td>Brazil</td>
<td>-0.084</td>
</tr>
<tr>
<td>Canada</td>
<td>3.251</td>
</tr>
<tr>
<td>Chile</td>
<td>-0.208</td>
</tr>
<tr>
<td>China</td>
<td>-0.570</td>
</tr>
<tr>
<td>Colombia</td>
<td>0.170</td>
</tr>
<tr>
<td>Costa Rica</td>
<td>0.239</td>
</tr>
<tr>
<td>Denmark</td>
<td>-0.599</td>
</tr>
<tr>
<td>Dominican Republic</td>
<td>0.248</td>
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<td>Egypt</td>
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<td>Finland</td>
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<td>France</td>
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<td>Germany</td>
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<td>Greece</td>
<td>0.239</td>
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<tr>
<td>Hong Kong</td>
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</tr>
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<td>Hungary</td>
<td>0.287</td>
</tr>
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<td>India</td>
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<td>Indonesia</td>
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<td>Ireland</td>
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<td>Israel</td>
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<tr>
<td>Italy</td>
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<td>Jamaica</td>
<td>0.226</td>
</tr>
<tr>
<td>Japan</td>
<td>7.212</td>
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<td>Korea, Republic of</td>
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</tr>
<tr>
<td>Kuwait</td>
<td>0.565</td>
</tr>
<tr>
<td>Malaysia</td>
<td>-0.318</td>
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<tr>
<td>Mexico</td>
<td>0.432</td>
</tr>
<tr>
<td>Morocco</td>
<td>0.237</td>
</tr>
<tr>
<td>Netherlands</td>
<td>4.705</td>
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<tr>
<td>New Zealand</td>
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</tr>
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<td>Norway</td>
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<td>Panama</td>
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<td>Philippines</td>
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<td>Poland</td>
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<td>Value</td>
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<tr>
<td>------------------</td>
<td>--------</td>
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<tr>
<td>Portugal</td>
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<tr>
<td>Qatar</td>
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<td>Singapore</td>
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<td>South Africa</td>
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<td>Spain</td>
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<td>Sweden</td>
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<td>Switzerland</td>
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</tr>
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<td>Taiwan</td>
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<tr>
<td>Thailand</td>
<td>0.188</td>
</tr>
<tr>
<td>Turkey</td>
<td>0.204</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>-1.356</td>
</tr>
<tr>
<td>Uruguay</td>
<td>0.251</td>
</tr>
<tr>
<td>Venezuela</td>
<td>0.035</td>
</tr>
</tbody>
</table>
Table 2

Determinants of Abnormal FDI
By Foreign Countries’ into the US, Using 1999 FDI Levels
(e_i from regression equation (13))

\[ e_1 = \beta_0 + \beta_1 \left( \frac{\text{Travel}_{i,US}}{\sum_j \text{Travel}_{j,US}} \right) + \beta_2 L_i + \beta_3 D_i + u_i \]

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Significance (t-value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>0.053</td>
</tr>
<tr>
<td>Travel to US</td>
<td>0.195</td>
</tr>
<tr>
<td>Language</td>
<td>-0.315</td>
</tr>
<tr>
<td>Distance</td>
<td>-.000</td>
</tr>
</tbody>
</table>

R-squared = 0.19  Observations = 56  F-statistic = 4.01  F-significance = 0.012
Table 3

Determinants of FDI by Foreign Countries into the U.S. Using 1999 FDI Levels, Travel average 1996-99
One-step Regression

\[
\frac{FDI_{i,US}}{\sum_j FDI_{j,US}} = \alpha_0 + \alpha_1 \left( \frac{FDI_{i,*}}{\sum_j FDI_{j,*}} \right) + \beta_1 \left( \frac{Travel_{i,US}}{\sum_j Travel_{j,US}} \right) + \beta_2 L_i + \beta_3 D_i + u_i
\]

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Significance (t-value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
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<tr>
<td>FDI Normalization</td>
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<tr>
<td>Travel to US</td>
<td>0.361</td>
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<tr>
<td>Language</td>
<td>-0.197</td>
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<tr>
<td>Distance</td>
<td>-0.000045</td>
</tr>
</tbody>
</table>

R-squared = 0.96  Observations = 56  F-statistic = 119.12  F-significance = 3.21E-25
Table 4

Determinants of U.S. FDI into other countries

Using 1999 FDI levels

\[
\frac{\text{FDI}_{US,i}}{\sum_{j} \text{FDI}_{US,j}} = \beta_0 + \beta_1 \frac{\text{Travel}_{US,i}}{\sum_{j} \text{Travel}_{US,j}} + \beta_2 L_i + \beta_3 D_i + u_i
\]

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Significance (t-value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>-.843</td>
</tr>
<tr>
<td>Travel from US</td>
<td>.846</td>
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<tr>
<td>Language</td>
<td>4.13</td>
</tr>
<tr>
<td>Distance</td>
<td>.0001</td>
</tr>
</tbody>
</table>

R-squared = 0.58  Observations = 48  F-statistic = 19.87  F-significance = .000
Table 5
Determinants of FDI by Foreign Countries into the U.S. Using 1999 FDI Levels, Travel average 1996-98
One-step Regression

\[
\frac{\text{FDI}_{i,US}}{\sum_j \text{FDI}_{j,US}} = \alpha_0 + \alpha_i \left( \frac{\text{FDI}_{i,*}}{\sum_j \text{FDI}_{j,*}} \right) + \beta_1 \left( \frac{\text{Travel}_{i,US}}{\sum_j \text{Travel}_{j,US}} \right) + \beta_2 L_i + \beta_3 D_i + u_i
\]

<table>
<thead>
<tr>
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<td>Constant</td>
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<td>Travel to US</td>
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<tr>
<td>Language</td>
<td>-0.203</td>
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<tr>
<td>Distance</td>
<td>-3.462</td>
</tr>
</tbody>
</table>

R-squared = 0.95  Observations = 56  F-statistic = 104.82  F-significance = 3.33E-22
Table 6

Granger Causality of Travel and FDI, 1952-1993

<table>
<thead>
<tr>
<th>Null Hypothesis</th>
<th>Obs.</th>
<th>F-Statistic</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Travel Into the U.S. does not cause FDI Into the US</td>
<td>163</td>
<td>7.4907</td>
<td>1.5E-05</td>
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<td>FDI Into the U.S. does not cause Travel Into the US</td>
<td>3.1749</td>
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<td>Travel Out of the U.S. does not cause FDI Out of the US</td>
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<td>2.5174</td>
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<tr>
<td>FDI Out of the U.S. does not cause Travel Out of the US</td>
<td>4.0563</td>
<td>0.0037</td>
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</table>
**Table 7**

**FDI Outbound versus FDI Inbound: 1952-1999**

<table>
<thead>
<tr>
<th>Regressor</th>
<th>Coefficient</th>
<th>Stan. Error</th>
<th>t-Stat</th>
<th>P-value</th>
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</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>83.0037</td>
<td>6.2021</td>
<td>13.3831</td>
<td>0.0000</td>
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<tr>
<td>FDI Inbound</td>
<td>1.2120</td>
<td>0.0203</td>
<td>59.6987</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

\[ R^2 = 0.9499 \quad \text{R}^2(\text{adj}) = 0.9496 \quad \text{S.E. Regression} = 68.7301 \]