INSTITUTIONAL QUALITY AND THE COMPOSITION OF FOREIGN DIRECT INVESTMENT

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ABSTRACT

This thesis analyzes the effect of institutions on sectoral composition of foreign direct investment. A model is developed which posits a continuum of firms operating in sectors with different capital intensities. Each firm can allocate capital to a foreign country. The model predicts that institutional quality is positively related to FDI inflows in all sectors, with an especially strong effect on capital-intensive sectors. These results are confirmed by an empirical analysis of accumulated bilateral FDI. Subsequently, the model is extended to account for international trade. It is found that differences in institutional quality affect the pattern of trade and further increase the asymmetry in sectoral structure of FDI. Developing countries with deficient institutions become specialized in exporting labor-intensive goods, and the bias towards labor-intensive FDI is further reinforced. Institutions thus play a crucial role in determining both the pattern of specialization and the composition of FDI flows, which accentuates the importance of institutional reforms in development policy.

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1. INTRODUCTION

Foreign direct investment (FDI) plays a crucial role in the global economy. It is an important component of cross-border capital flows, and is directly related to production decisions of multinational firms, which play a dominant role in many industries. Moreover, FDI inflows have a substantial effect on productivity and growth in the recipient country. As Arteta, Eichengreen and Wyplosz (2003) write,

> "[t]here is now a substantial body of evidence that openness to foreign direct investment (FDI) is positively associated with growth. FDI is a conduit for transfer of technological and organizational knowledge, suggesting that countries that welcome inward FDI should have higher levels of total factor productivity and enjoy faster economic growth."

For these reasons, the question of what determines the amount and direction of foreign direct investment has received much attention in both theoretical and empirical literature. Equally significant are the determinants of distribution of FDI between sectors, since inflows into different industries may have dissimilar effects on production, trade, and welfare.

At the same time, a large amount of research has focused on the effect of institutional factors on economic growth. Institutions, famously defined by North (1991) as "humanly devised constraints that structure political, economic and social interaction," may affect an economy in a variety of ways, and the influence of factors such as property rights, rule of law, corruption, etc. on economic performance and development has received much consideration in recent years. As Keefer and Shirley (2000) observe, "[t]he theory and recent cross-country evidence linking institutions and economic growth suggest that institutional development ought to be at the core of economic development policy."

This thesis attempts to bring together these two directions of research. It builds a simple model explaining foreign direct investment decisions by firms operating in sectors with different capital intensities in presence of cross-country institutional differences. Based on an

assumption – supported by previous studies – that institutional quality affects the cost of utilizing capital, the model concludes that flawed institutions in the host country reduce overall FDI inflows and make them biased towards less capital-intensive industries. Both of these predictions are confirmed by empirical evidence.

Additionally, I extend the model to include international trade. It is shown that institutional differences become a source of specialization. A developing country with a low level of institutional quality tends to specialize in exporting labor-intensive products while importing capital-intensive goods. Accordingly, FDI flowing into countries with deficient institutional environment becomes even more biased towards labor-intensive sectors. Institutions thus influence the relationship between trade and FDI and affect reallocations across sectors that arise from trade liberalization.

The rest of the thesis is structured as follows. Chapter 2 reviews the relevant literature and identifies the place of this study in the context of previous research. Chapter 3 outlines the basic model of FDI in presence of differences in institutional environment and derives predictions about the volume and composition of FDI. Chapter 4 tests these predictions using a dataset of bilateral FDI stocks across a large group of countries and industries. Chapter 5 extends the baseline model, examining a case when international trade exists. Finally, Chapter 6 concludes.

2. REVIEW OF LITERATURE

The question of what determines foreign direct investment decisions has received much attention over the years. Researchers' efforts to understand FDI can be roughly grouped into three general approaches: the macro-based approach, the trade-based approach, and the approach that can be broadly defined as institutional.

The macro-based literature analyses foreign direct investment largely within the more general context of cross-border capital flows. Interest in capital flows is partly motivated by the observation that differences in rate of return to capital – traditionally seen as the main driver for investment decisions – predict the levels of capital flows from rich to poor countries that is far in excess of what is actually observed. As Lucas (1990) has famously shown, under standard neoclassical assumptions, the disparity in labor productivity between India and the U.S. implies that the marginal product of capital – and hence the rate of return – would be dozens of times higher in India than in the U.S. Such an enormous difference, and the presumably similar differences between the U.S. and other developing countries, would generate massive capital flows into the Third World, which we do not observe.

Several explanations of this paradox have been offered. Lucas (1990) himself suggested that the inexplicably low level of capital flows into developing countries may be caused by differences in human capital endowments, which can reduce the actual rate of return differential. Nevertheless, certain other studies have focused on other explanatory factors, including institutional differences. For example, Alfaro, Kalemli-Ozcan and Volosovych (2005) have concluded that institutions have a substantial effect on capital flows – according to one of their results, raising the institutional quality of Peru to the level of Australia would quadruple capital inflows.

The trade-based approach to analysis of FDI has grown out of the field of international trade. It is partly a result of the development of "new trade theory" models, which focus on the impact of industry structure, market size, and agglomeration effects on trade. These models have significantly contributed to understanding of the field but, as Markusen (1995) notes, their drawback lies in their tendency to see each firm as an entity producing a single product in a single location. This ignores the fact that many industries are dominated by multinational enterprises which make endogenous choices about location of production facilities (Markusen and Venables, 2000). Hence, a model is required that would allow for both trade and FDI decisions to be determined endogenously.

Discussion of foreign direct investment and other forms of factor mobility within the framework of international trade theory has in fact been going on for a rather long time. An early example of such analysis is the work of Mundell (1957). Mundell demonstrated that trade in goods and factor movements (including foreign investment) are substitutes and have similar effects on the resulting general equilibrium. Hence, factor movements are largely irrelevant for the pattern of trade. However, others – e.g. Neary (1995), and Markusen (1997) – have shown that this result is a special property of Hecksher-Ohlin-Vanek model of international trade, and that trade and capital movement may be complements under certain conditions. Hence, more explicit models of investment decisions in a multi-country framework became necessary.

Trade-based analysis of foreign direct investment typically makes a distinction between horizontal FDI, in which firms establish plants producing the same product in different countries, and vertical FDI, in which firms decompose production into stages that are geographically separated. The former type of FDI is described by authors such as Brainard (1997), and Markusen and Venables (2000). In these papers, foreign investment decisions are

mainly driven by a combination of economies of scale (which favor geographical concentration) and trade costs (which encourage dispersion).

Analysis of vertical FDI dates back to Helpman's (1984) seminal article; vertical FDI was further examined by Markusen et al (1996), Markusen (1997), and Yeaple (2003). According to these studies, firms distribute production processes between countries based on these countries' factor endowments and relative factor intensities of different stages of production; furthermore, vertical FDI is high when trade costs are small, since intermediate inputs can be more easily transported.

Recently, researchers have also started to focus on firm-level determinants of FDI. This line of reasoning has been based on the work of Melitz (2003), who linked firm decisions to export to productivity levels, which are heterogeneous across firms. This idea was extended to the study of FDI by Helpman, Melitz, and Yeaple (2004), who concluded that when fixed costs of exporting and of investing abroad are present, only the most productive firms serve foreign markets, and out of these, the most productive ones do it through FDI rather than trade.

Overall, the trade-based approach to FDI has focused on explaining foreign investment decisions through factors such as trade costs, factor endowments, and distribution of firm-specific productivity levels. Differences in institutional quality between countries have not figured prominently in trade-based studies. An important exception to this is a line of research exemplified by Antras (2005), and Antras and Helpman (2004, 2007), who discuss the effect of contracting institutions on vertical FDI decisions. This approach presents a decision whether to engage in FDI as a choice between outsourcing production of intermediate inputs and integrating it within the firm. It builds on the analysis by Grossman and Hart (1986), who propose that under incomplete contracts, control over production assets

is a source of bargaining power and hence has an affect on the way the surplus is distributed. The authors show that strength of contracting institutions affects FDI decisions.

However, it is important to note that the abovementioned papers have dealt with the effect of institutions on vertical FDI. At the same time, there are indications (Markusen and Maskus, 2002) that horizontal FDI is more prevalent.

Finally, the third approach to the study of foreign direct investment is largely rooted in institutional theory. In recent years, there has been a significant amount of research concerning the reaction of FDI to institutional factors such as corruption (Wei, 2000), political instability (Janeba, 2002), democratic governance (Jensen, 2003; Li and Resnik, 2003), etc. However, for the most part, this approach has not discussed the link between FDI and trade, either as substitutes or complements.

Furthermore, little attention has been paid to examining the effect of institutions on the sectoral composition of FDI, rather than on its aggregate level. Admittedly, some empirical studies in this area have been performed. For example, Gonzales-Eiras and Prado (2007) have looked at the effect of host-country institutions such as property rights, labor standards, or constitutional arrangements on U.S. FDI flows into capital- and R&D-intensive sectors. Wezel (2003), using data on German firms' foreign investment decision, concluded that capital-intensive industries exhibit greater sensitivity to changes in regulatory environment. Nevertheless, there have been few, if any, attempts to explicitly model the effect of recipient-country institutions FDI inflows into sectors with different capital intensities.

Therefore, this thesis complements existing research in two ways. First, it formulates a simple model generating testable predictions regarding the effect of institutions on FDI inflows into sectors which differ by their capital intensities. Second, it uses this model to make predictions about the interaction between FDI and trade in presence of cross-country

institutional differences, and about the likely impact of trade liberalization and institutional reforms on FDI in the face of such differences.

3. BASIC MODEL

In this part, I delineate a baseline model of foreign direct investment in a situation when institutions are different across countries.

3.1. Model Setup

The model assumes that there exist two countries, named Source (S) and Host (H) and indexed by $i = \{S; H\}$. Each country is endowed with a certain amount of labor. The economy of Source includes a representative consumer and a single perfectly competitive sector which produces a homogenous good from labor, using one-to-one technology. Additionally, Source economy contains a continuum of sectors producing differentiated varieties, indexed by $\theta \in (0;1)$. In each of these latter sectors, a single firm[1] produces a unique good using capital and labor, with capital intensity θ. Host also contains a representative consumer and the homogenous-good sector, but differentiated-good sectors are initially absent.

The homogenous good is not tradable across countries[2] and in the baseline model, the differentiated goods cannot be traded either. Hence, a Source firm from one of the differentiated-variety sectors willing to sell its product in Host has to produce it there. To produce in either country, each firm has to hire local labor at the local wage. On the other hand, capital, regardless of whether it is used in Source or in Host, is borrowed on the world market at a rate r, which is exogenously fixed.

[1] Firms are assumed to be small enough to take aggregate parameters such as wage rate or consumer income as given.
[2] The non-tradable, labor-only sector can be interpreted as, for instance, the services sector.

Country *i* consumer has an income R_i. Consumer preferences are such that the consumer in either country spends a share $\beta \in (0;1)$ of her income on differentiated goods, and 1-β on the homogenous good. In future analysis, I will focus on differentiated-good sectors[3].

3.2. Demand

The representative consumer in country *i* maximizes a Dixit-Stiglitz (1977) CES utility function over a continuum of differentiated varieties indexed by $\theta \in (0;1)$. The utility function of country *i*'s consumer takes the form:

$$U = \left[\int_0^1 q_i(\theta)^\rho d\theta \right]^{\frac{1}{\rho}} ,$$

where $0 < \rho < 1$, and $q_i(\theta)$ denotes the quantity of variety θ consumed in country *i*.

This function is then maximized subject to a budget constraint:

$$\int_0^1 p_i(\theta) q_i(\theta) d\theta = Y_i ,$$

where $p_i(\theta)$ is the price of variety θ in country *i*, and $Y_i = \beta R_i$ is the part of income that country *i* consumer spends on differentiated varieties.

As shown by Dixit and Stiglitz (1977), maximization produces the following equations for optimal consumption and expenditure:

$$q_i(\theta) = Q_i \left[\frac{p_i(\theta)}{P_i} \right]^{-\frac{1}{1-\rho}}$$

$$p_i(\theta) q_i(\theta) = Y_i \left[\frac{p_i(\theta)}{P_i} \right]^{-\frac{\rho}{1-\rho}}$$

where $Q_i \equiv U$ is the amount of the aggregate good (i.e. utility of country *i* consumers), and P_i is the price index.

[3] The homogenous-good sector is included into the model mainly to ensure that the solution is interior.

Expressing P_i from the first equation, plugging it into the second, and solving for $p_i(\theta)$, we obtain the following equation for price of good θ in county i:

$$p_i(\theta) = Y_i Q_i^{\rho} q_i(\theta)^{\rho-1}.$$

3.3. Production

Each firm produces its variety using Cobb-Douglas technology. Specifically, a firm operating in sector with capital intensity θ will produce $q_S(\theta) = K_S(\theta)^{\theta} L_S(\theta)^{1-\theta}$ of the good in Source, and $q_H(\theta) = K_H(\theta)^{\theta} L_H(\theta)^{1-\theta}$ in Host, where $K_S(\theta)$ and $L_S(\theta)$ are the amounts of capital and labor employed by this firm in Source, while $K_H(\theta)$ and $L_H(\theta)$ are the amounts of each factor employed in Host, respectively. In the subsequent discussion, the index θ will be suppressed.

Labor in each country is paid the local equilibrium wage w_i, i = {S;H}. Capital owners are paid the fixed rate r, but this is not the only cost that the use of capital incurs. Specifically, in addition to the rental rate, firms operating in a country face a cost of investing capital, which is created by that country's institutional environment. This country-specific cost is expressed as a parameter $\mu_i \geq 1$, which measures country i's institutional environment, with higher levels of μ_i corresponding to lower institutional quality. The overall cost of using K_i of capital in country i is $r\mu_i$.. Effectively, low institutional quality is analogous to a tax on capital.

There may be several reasons why poor institutional environment can generate an extra cost of capital use. For example, high corruption can create costs that would disproportionately affect firms which use a large amount of capital[4]. Similarly, lack of secure property rights may create a risk of expropriation – by the government or by other actors – of some or all of previously invested assets, which makes investing capital more costly. The

[4] Svensson (2003, 2005) presents theory and evidence showing that in highly corrupt countries, an ability to credibly threaten to shut down production gives firms a more favorable threat point in bargaining with corrupt officials over bribes. As a result, the bribes that such firms have to pay are lower. Since firms that invest a significant amount of capital are less likely to make a credible threat to this effect, it follows that the cost of corruption is higher if a firm uses more capital.

same is true if a country is politically unstable, creating a risk of losing invested capital due to a drastic shift in policies, a change in legislation, or an armed conflict[5]. Additionally, institutional problems which lead to inefficient regulation can generate an extra cost of utilizing capital[6].

In the subsequent analysis, $r\mu_S$ will be normalized to one. Hence, the cost of using one unit of capital would equal 1 in Source and $\frac{\mu_H}{\mu_S} \equiv \lambda$ in Host, where $\lambda \in (0;\infty)$ measures Host institutions compared to Source institutions. Specifically, higher λ implies lower quality of Host institutions compared to Source institutions, with λ above (below) one signifying a less (more) benevolent institutional environment in Host compared to Source.

Each firm maximizes its profit, which is equal to:

$$\pi = p_S {K_S}^{\theta} {L_S}^{1-\theta} + p_H {K_H}^{\theta} {L_H}^{1-\theta} - w_S L_S - w_H L_H - K_S - \lambda K_H .$$

After plugging in the previously obtained inverse demand function, the following profit maximization problem is derived:

$$\max_{K_S,K_H,L_S,L_H} \pi = Y_S {Q_S}^{-\rho} \left({K_S}^{\theta} {L_S}^{1-\theta}\right)^{\rho} + Y_H {Q_H}^{-\rho} \left({K_H}^{\theta} {L_H}^{1-\theta}\right)^{\rho} -$$
$$- w_S L_S - w_H L_H - K_S - \lambda K_H$$

3.4. Equilibrium

Maximizing the expression above with respect to K_S, L_S, K_H, L_H results in the following set of first-order conditions:

$$\rho\theta Y_S {Q_S}^{-\rho} \left({K_S}^{\theta} {L_S}^{1-\theta}\right)^{\rho-1} {K_S}^{\theta-1} {L_S}^{1-\theta} = 1$$

$$\rho(1-\theta) Y_S {Q_S}^{-\rho} \left({K_S}^{\theta} {L_S}^{1-\theta}\right)^{\rho-1} {K_S}^{\theta} {L_S}^{-\theta} = w_S$$

[5] Janeba (2002) develops a model explaining that firms which can shift production from one country to another – which are likely to be the firms that require less capital investment – are less affected by political risk.
[6] Shleifer and Vishny (1994) show how regulation that lacks efficiency or is captured by special interests can lead politicians to encourage an inefficiently high level of employment, which can conceivably have a more severe effect on firms that, in equilibrium, tend to employ comparatively little labor and much capital.

$$\rho\theta Y_H Q_H{}^{-\rho}\left(K_H{}^{\theta}L_H{}^{1-\theta}\right)^{\rho-1}K_H{}^{\theta-1}L_H{}^{1-\theta}=\lambda$$

$$\rho(1-\theta)Y_H Q_H{}^{-\rho}\left(K_H{}^{\theta}L_H{}^{1-\theta}\right)^{\rho-1}K_H{}^{\theta}L_H{}^{-\theta}=w_H$$

Solving the system of equations above gives the following expressions for K_H and K_S:

$$K_S = MQ_S{}^{-(\sigma-1)}Y_S{}^{\sigma}w_S{}^{-(1-\theta)(\sigma-1)}$$

$$K_H = MQ_H{}^{-(\sigma-1)}Y_H{}^{\sigma}w_H{}^{-(1-\theta)(\sigma-1)}\lambda^{(1-\theta)(\sigma-1)-\sigma},$$

where $M \equiv \left(\frac{\sigma-1}{\sigma}\theta^{\theta}(1-\theta)^{1-\theta}\right)^{\sigma}\left(\frac{\theta}{1-\theta}\right)^{1-\theta} > 0$, and $\sigma \equiv \frac{1}{1-\rho} > 1$ denotes the elasticity of substitution between differentiated varieties.

Since $\sigma > 1$, it is evident from the equation above that K_i is increasing in Y_i for any value of θ – in other words, larger economies receive more capital in every sector. Furthermore, because $0 < \theta < 1$, an increase in w_i reduces K_i (holding income levels constant), reflecting the fact that higher wage rates, ceteris paribus, discourage production.

However, the primary question relates to the effect of a change in institutional quality on K_H. Two results can be observed:

Result 1: A decline (increase) in Host institutional quality results in a lower (higher) level of FDI in all sectors.

To see this, note that the exponent on λ is negative. Hence, a change in λ – i.e. a deterioration of Host's institutional environment, relative to that of Source – causes K_H to move in the opposite direction, regardless of θ. Intuitively, poor institutions increase the cost of production, thus discouraging FDI, and vice versa.

Result 2: The effect of a change in Host institutional quality on FDI is stronger for sectors with higher capital intensity.

This can be seen from the fact that an increase in θ raises the absolute value of the exponent on λ, and therefore, the effect of an increase or a fall in λ is greater. Intuitively,

institutional environment influences production by affecting the cost of utilizing capital. Consequently, firms that use relatively more capital are more affected by institutions.

These two results underscore the role of institutions as a determinant of growth. While it is largely accepted that institutional quality affects performance of domestic firms, Result 1 shows that the decision of foreign multinationals whether to invest in a country depends on the quality of institutions in that country, compared to other countries.

Furthermore, Result 2 shows that, in addition to reducing FDI across the board, poor institutional environment is particularly damaging to FDI in capital-intensive sectors. FDI flowing into economies that lack sound institutional foundations will be biased towards sectors that utilize a large amount of labor, compared to capital. Therefore, improvement in institutional quality is especially crucial for countries that wish to move away from excessive reliance on a narrow range of labor-intensive industries.

The relationship between institutional quality and aggregate FDI inflows may serve as a partial explanation of the often-quoted (e.g. de Soysa, 2003) observation that most of the foreign direct investment takes place between wealthy countries. If poor countries are plagued by institutional problems, FDI inflows are discouraged, and this effect may outweigh advantages that may arise from cheap labor or abundant natural resources.

At the same time, the link between institutions and the structure of FDI is an additional argument for assigning high priority to institutional reform. Not only does improving institutional quality – such as reducing corruption, enforcing rule of law, etc. – increase FDI, but it also produces a particularly strong increase in FDI flowing into capital-intensive sectors, which may be beneficial if capital inflows into these sectors have a stronger positive effect on wages or creates more possibilities for technology transfer.

4. EMPIRICAL EVIDENCE

This part of the thesis provides empirical evidence supporting the main predictions of the baseline model. Specifically, it tests Result 1 and Result 2.

4.1. Variables and Data

The principal dependent variable used is the gross stock of bilateral FDI in a particular industry. Thus, each observation is associated with a particular source country, host country and industry. Data on FDI (in EUR millions) is taken from the Eurostat dataset on bilateral FDI as of 2005 and includes observations on 22 source countries, 63 host countries, and 12 industries (Eurostat, 2008). Unfortunately, many observations are missing, which makes the total sample size equal to 8047 observations.

Table 2 and Table 3 in Appendix B list the source and host countries in the sample, respectively. It can be seen that all of the source countries are EU member states, while the sample of host countries includes EU member states (both "old" and "new"), non-EU industrialized countries, non-EU transition economies, and less developed countries.

As proxies for host country institutional quality, I use the six World Bank Governance Indicators (World Bank, 2008)[7]. These indicators measure the quality of countries' governance and institutions on the following six dimensions:

- **Voice and Accountability** – "measures the extent to which country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media."

[7] These indicators have also been used as a measure of institutional quality in other studies (e.g. Linders et al, 2005; Murrell, 2005)

- **Political Stability and Absence of Violence** – "measures the perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including domestic violence and terrorism."
- **Government Effectiveness** – "measures the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies."
- **Regulatory Quality** – "measures the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development."
- **Rule of Law** – "measures the extent to which agents have confidence in and abide by the rules of society, in particular the quality of contract enforcement, the police, and the courts, as well as the likelihood of crime and violence."
- **Control of Corruption** – "measures the extent to which public power is exercised for private gain, including petty and grand forms of corruption, as well as "capture" of the state by elites and private interests."

These indicators are measured on a scale ranging from -2.5 to 2.5, with higher values indicating higher quality of governance in a particular category. Since FDI stocks are accumulated over a long time and are thus likely to be affected by past as well as present scores, I use (in each dimension) the average of the scores for the years from 1996 through 2006.

All six indicators are highly correlated (pairwise correlation coefficients range from 0.80 to 0.98), and Cronbach's alpha of the group of all six equals 0.977. This suggests that all six indicators can be regarded as a reflection of a single measure of institutional characteristics. Consequently, to avoid multicollinearity issues and to make interpretation of

the estimated coefficients easier, I combine these six variables into a single index of institutional quality by summing each country's scores over the six dimensions[8]. The resulting index thus assigns the same weight to each category of governance, and its values can range between -15 and 15.

I measure capital intensity of each industry as one minus the ratio of that industry's personnel costs to value added at factor cost. Data is taken from Eurostat dataset on EU-wide enterprise statistics for 2005, aggregated across countries (Eurostat, 2008). Since all the source countries in the sample are EU member states, and the sample incorporates 22 out of 27 member states (including the four largest economies of the EU), the use of the aggregated measure is appropriate. Table 4 in Appendix B lists industries and their capital intensities.

Furthermore, several control variables are used. Their choice is based on the gravity approach, which has become a workhorse model for empirical analysis of bilateral cross-border flows such as trade, tourism, and migration (Bergstrand, 1985; Anderson and van Wincoop, 2003). Being analogous to Newton's law of universal gravitation, the gravity model links the magnitude of cross-border bilateral flows to measures of each country's size and of distance between them. Recently, gravity variables have also been used by Wei (2000) as controls in his analysis of bilateral FDI.

In this thesis, I use GDP and population of source and host countries as measures of size. Data on both variables is taken from the IMF World Economic Outlook database (International Monetary Fund, 2008). GDP is given in billions of U.S. dollars at purchasing power parity. Population is given in millions. Both GDP and population are calculated as of 2005.

[8] The resulting index is also highly correlated (correlation = 0.77) with the Index of Economic Freedom published by the Heritage Foundation (2008), which can serve as another measure of institutional quality. This suggests that the index obtained from the Governance Indicators data does not contain measurement peculiarities that would endanger the validity of estimation results.

Distance is represented by three groups of variables reflecting physical, cultural, and historical distance. Physical distance is depicted by two variables – geographical distance in kilometers between the countries' main population centers, and a dummy indicating whether the two countries share a land border. Cultural distance is described by a dummy showing whether the two countries share an official language, and another dummy indicating whether the countries have a common language spoken by at least 9% of the each country's population. Historical distance is represented by a set of three dummies showing whether the two countries have ever been part of a single state or a colonial empire for an extended period; whether both countries were EU members during the period to which the data refers[9]; and whether both countries have been members of the Council for Mutual Economic Assistance[10]. Data on all measures of distance except the latter two is taken from the distances database of the CEPII research center (Centre d'Etudes Prospectives et d'Informations Internationales, 2008).

To ease interpretation, and in accordance with the conventional method of estimating gravity-type equations (e.g. Wei, 2000; Santos Silva and Tenreyro, 2006), the dependent variable, as well as GDP, population, and distance in kilometers, are given in logs.

An important question that needs to be addressed is whether institutions are fully exogenous. It may happen that foreign direct investment has some influence on institutions – for instance, if foreign firms use lobbying power to push for certain legal changes that affect institutional quality. However, while it is possible that FDI can cause such an effect, it is unlikely that this effect would have be different across sectors. Hence, endogeneity is not a serious concern for this study.

The table below shows summary statistics.

[9] Since FDI stocks are observed as of 2005, only the EU-25 countries are counted as EU members.
[10] Germany is counted as a former Comecon member, due to East Germany's membership. Nations of the former Yugoslavia, which was an associate member, are also counted as members.

Table 1: Summary Statistics

Variable	Mean	Standard deviation	Minimum	Maximum
FDI, EUR mill.	129.664	1181.104	0	51860
Quality of institutions	4.314	4.956	-7.246	11.225
Capital intensity	0.378	0.129	0.151	0.632
Source country GDP, USD bill. at PPP	435.755	704.713	19.252	2514.783
Host country GDP, USD bill. at PPP	1084.843	2128.667	10.573	12433.92
Source country population, mill.	15.381	23.046	0.404	82.438
Host country population, mill.	107.032	263.216	0.3	1307.56
Geographical distance, km	5018.696	4429.547	59.617	19263.88
Shared border	0.052	0.222	0	1
Shared official language	0.056	0.229	0	1
Shared language spoken by at least 9% of population	0.062	0.241	0	1
Formerly in the same state or colonial empire	0.07	0.254	0	1
Both countries are EU members	0.41	0.492	0	1
Both countries were Comecon members	0.19	0.392	0	1

As the table shows, the sample includes a wide variety of countries and country pairs. The host country with the lowest institutional quality (amounting to -7.2) is Nigeria, while Finland has the best institutions out of the countries in the sample (with institutional quality index equaling 11.2 out of the theoretical maximum of 15). Additionally, source countries are different in size of their GDP and population, varying from Malta to Germany. The same can be said about host countries, which range in size from Iceland to China. Finally, in terms of distances between principal economic centers, country pairs range from those whose main cities are very closely located (Slovakia and Austria) to those whose largest population centers are very distant (France and New Zealand).

4.2. Statistical Estimation

4.2.1. Preliminary OLS model

I begin the analysis by estimating an equation of the following form, using OLS:

$$\ln(FDI_{ijk}) = \alpha_0 + \alpha_1 QI_j + \alpha_2 CI_k + \alpha_3 CI_k * QI_j + X\beta + \varepsilon_{ijk} \ ,$$

where FDI_{ijk} is the accumulated amount of FDI from country i to country j in industry k, QI_j is the quality of institutions in country j, CI_k is the capital intensity of industry k, X is the vector of controls, and ε_{ijk} is an i.i.d. disturbance term.

If Result 1 is correct, the marginal effect of QI_j on FDI_{ijk} should be positive, which requires that $\alpha_1 + \alpha_3 CI_k$ are positive at any realistic level of CI_k. Similarly, if Result 2 is correct, α_3 has to be positive.

I then add host country, source country, and industry dummies to control for possible country and industry effects. Addition of host country dummies requires omitting QI_j as well as host and source county GDP and population controls from the specification, because these variables are country-specific. Similarly, because capital intensity is an industry-specific characteristic, CI_k is dropped when industry dummies are included.

4.2.2. Correction for Zero Values

An important obstacle to consistent estimation of the model used in this thesis (and indeed of most other gravity-type equations) lies with the structure of the data – specifically, with the large number of zero observations of the dependent variable. This creates a problem, because standard equations of this type require the dependent variable to be in logarithmic form, yet the logarithm of zero is not defined. Several methods of addressing this issue have been proposed.

The preliminary OLS estimation described above necessarily restricts the sample to non-zero observations. This is the most commonly used method (Linders and de Groot, 2006). However, it is likely that zero values of FDI do not occur randomly. Therefore, omitting zeroes can lead to inconsistent estimates.

A different method of dealing with zero values is to add a small positive constant to the dependent variable (or alternatively, to replace zero values with a small constant), thus making the entire sample positive. While such a transformation ensures that none of the

observations are dropped, the resulting estimation is still flawed. The constant is inevitably chosen arbitrarily and there is no reason to believe that it reflects the expected value. Hence, this approach fails to guarantee the consistency of the resulting estimates (Linders and de Groot, 2006).

Yet another method that can be used to circumvent the problem of zero values is to apply the Tobit model with a lower threshold set at zero. However, Tobit estimation assumes that zero values may be a result of the underlying structural model generating negative desired levels of FDI. However, the model developed in this thesis cannot produce negative optimal values of K_H, and it is therefore difficult to find theoretical justification for using Tobit[11].

Hence, none of the approaches discussed so far is entirely satisfactory. Therefore, the method I use in this thesis is to apply Heckman's two-stage sample selection model (Heckman, 1979). The application of Heckman sample selection model to estimating gravity and related equations was first proposed by Linders and de Groot (2006).
This method would assume that due to factors outside the scope of the structural model, an industry in a certain source country may invest nothing into a particular host country[12]. The structural model would then determine the amount of FDI in cases when it is positive. Estimation thus consists of two stages: first, a selection equation is estimated by regressing a dummy for whether $FDI_{ijk} > 0$ on a set of variables including QI_j, CI_k , $CI_k * QI_j$, and controls, as well as source country, host country, and industry dummies, using probit. The second-stage equation is specified as the OLS equation above, without the dummies.

[11] Furthermore, it is generally difficult to conceptualize an optimizing framework that would produce negative desired values of FDI. Linders and de Groot (2006) make the same conclusion with respect to gravity models of trade.
[12] For example, this may happen because the industry is not present in that source country, or because the two countries are too small or too distant.

4.3. Results

Table 5 in Appendix C shows the regression results.

We can conclude from the table that the estimated marginal effect of institutional quality on FDI is positive. Indeed, for the specifications in which QI_j is present – that is, specifications (1), (3), and (5) – the estimated marginal effect equals -0.011 + 0.153*CI_k; -0.006 + 0.16*CI_k, and -0.019 + 0.172*CI_k, respectively. Since the minimum value of CI_k in the sample is 0.151 (see Table 1), the marginal effect is always positive. Therefore, Result 1 is confirmed.

Moreover, the table shows that the coefficient on the interaction between capital intensity and institutional quality is positive and statistically significant in all specifications (with a significance level of at least 5% in all specifications except the first). This implies that the positive effect of institutional quality on FDI is greater in magnitude if a sector's capital intensity is higher.

Furthermore, the magnitude of the coefficients suggests that the difference in effects between sectors is numerically sizeable. For example, if we use the results of the last and theoretically best supported specification, we can observe that for the least capital-intensive industry (manufacture of vehicles and transport equipment), an increase in institutional quality of one standard deviation leads to -0.019*4.956 + 0.172*4.956*0.151 = 3% increase in accumulated inwards FDI. On the other hand, FDI in the industry with the highest capital intensity (electricity, gas and water supply) would rise by -0.019*4.956 + 0.172*4.956*0.632 = 44%.

Taking an extreme hypothetical scenario, an increase in the quality of Nigeria's institutions to the level of Finland would, if other variables are held constant[13], increase

[13] This scenario is, of course, purely speculative. GDP, for instance, is highly unlikely to remain unaffected if such a massive change in institutional quality takes place. On the other hand, regressions show that GDP has a

foreign direct investment into Nigeria's transport manufacturing sector by 13%, while investment into utilities sector would rise by 166%.

This suggests that there is a statistically significant and quantitatively large difference in the impact of institutional quality changes on sectors with different capital intensity levels. Hence, Result 2 is also confirmed.

Other coefficients are also worthy of note. Both host and source country GDP are positively related to the amount of FDI, as can be expected. Furthermore, source country population is positively related to FDI inflows.

Additionally, geographical distance has a negative and statistically significant effect on foreign investment. On the other hand, contiguous countries exhibit no tendency to invest larger amounts of capital into each other, yet having a common border does increase the probability that some amount of capital is invested (see Table 6). The same is true for countries which share the same widely-spoken language. It may be the case that sharing a border or having a common language reduces the fixed cost of cross-border investment, but not the variable cost of production.

Finally, shared historical experience – either a colonial relationship or being part of a larger state – has a large and statistically significant effect on FDI, increasing expected FDI stock by 62-88%. Bilateral FDI flows do not seem to be positively influenced by both countries' EU membership, but curiously, coefficients in some specifications point to a positive effect of Comecon membership, which ended almost twenty years ago. This may be either a reflection of a lasting effect of inter-enterprise linkages dating from that period, or simply a result of a similarity in political and economic systems which makes investing easier.

positive effect on FDI, which suggests that a change in FDI inflows from such a radical improvement in institutions would, if anything, be even more drastic.

5. EXTENDED MODEL

In this section, I extend the simple model presented above by allowing for a possibility of international trade in differentiated varieties. Specifically, a firm operating in each of the differentiated-good sectors can transport an amount *z* of its variety from Source to Host. The value of *z* can be positive, zero, or negative, with a negative value indicating that the variety is exported from Host to Source. This comes at a cost – shipping *z* units of a good will cost the firm tz^2, regardless of the direction of trade, where $t > 0$ is a measure of trade costs[14]. The homogenous good remains non-tradable.

Importantly, the model assumes that institutional differences do not affect the cost of trade. Others (e.g. Anderson and Marcouiller, 2002; Linders et al, 2005) have proposed that flawed institutions increase transaction costs and hence serve as an additional barrier to international trade. In this thesis, I abstract from these effects and assume that institutions influence trade through production costs only.

5.1. Equilibrium with Trade

When trade is allowed, each firm faces the following profit maximization problem:

$$\max_{K_S,K_H,L_S,L_H,z} \pi = Y_S Q_S^{-\rho}\left(K_S^{\theta} L_S^{1-\theta} - z\right)^{\rho} + Y_H Q_H^{-\rho}\left(K_H^{\theta} L_H^{1-\theta} + z\right)^{\rho} -$$
$$- w_S L_S - w_H L_H - K_S - \lambda K_H - tz^2$$

Maximization with respect to K_S, L_S, K_H, L_H results in the four first-order conditions:

$$\rho\theta Y_S Q_S^{-\rho}\left(K_S^{\theta} L_S^{1-\theta} - z\right)^{\rho-1} K_S^{\theta-1} L_S^{1-\theta} = 1$$

$$\rho(1-\theta) Y_S Q_S^{-\rho}\left(K_S^{\theta} L_S^{1-\theta} - z\right)^{\rho-1} K_S^{\theta} L_S^{-\theta} = w_S$$

$$\rho\theta Y_H Q_H^{-\rho}\left(K_H^{\theta} L_H^{1-\theta} + z\right)^{\rho-1} K_H^{\theta-1} L_H^{1-\theta} = \lambda$$

[14] In this setting, z refers to the net, rather than gross export of a variety. However, in the presence of trade costs, engaging in trade in both directions will never be optimal for a firm. Hence, this distinction is irrelevant.

$$\rho(1-\theta)Y_H Q_H{}^{-\rho}\left(K_H{}^{\theta}L_H{}^{1-\theta}+z\right)^{\rho-1}K_H{}^{\theta}L_H{}^{-\theta}=w_H$$

Solving the system gives the following expressions for K_S and K_H:

$$K_S = MQ_S{}^{-(\sigma-1)}Y_S{}^{\sigma}w_S{}^{-(1-\theta)(\sigma-1)}+\left(\frac{\theta}{1-\theta}\right)^{1-\theta}w_S{}^{1-\theta}z$$

$$K_H = MQ_H{}^{-(\sigma-1)}Y_H{}^{\sigma}w_H{}^{-(1-\theta)(\sigma-1)}\lambda^{(1-\theta)(\sigma-1)-\sigma}-\left(\frac{\theta}{1-\theta}\right)^{1-\theta}w_H{}^{1-\theta}\lambda^{\theta-1}z$$

Note that the optimal amounts of K_S and K_H have changed compared to the model outlined in Chapter 3, and the direction of the change depends on the sign of *z*. Specifically, when trade is allowed, K_S is lower (higher) and K_H is higher (lower) in sectors where the optimal *z* is negative (positive). The magnitude of this change is proportional to the value of *z*. In other words, liberalization of trade increases FDI in some sectors while decreasing it in other sectors, compared to autarky. This is because under trade, certain sectors of the Host economy begin to serve the demand in Source in addition to producing for the domestic market. On the other hand, firms in some other sectors begin to use trade instead of FDI as a strategy to penetrate the Host market.

Hence, finding the optimal value of *z* is necessary to solve the problem. Maximizing the expression for profit given above with respect to *z* adds the following equation to the four first-order conditions shown above:

$$-\rho Y_S Q_S{}^{-\rho}\left(K_S{}^{\theta}L_S{}^{1-\theta}-z\right)^{\rho-1}+\rho Y_H Q_H{}^{-\rho}\left(K_H{}^{\theta}L_H{}^{1-\theta}+z\right)^{\rho-1}=2tz$$

The solution of the resulting system of five equations is given by the following proposition:

Proposition 1: for a given industry θ the level of exports equals:

$$z=\frac{1}{2t\theta^{\theta}(1-\theta)^{1-\theta}}\left(\lambda^{\theta}w_H{}^{1-\theta}-w_S{}^{1-\theta}\right)$$

Proof: see Appendix A.

It is evident from this expression that z is inversely related to t – i.e. the amount of traded goods is decreasing in trade costs.

Moreover, we can observe that $z > 0$ if and only if $\lambda^{\theta} > \omega^{1-\theta}$, where $\omega = \frac{w_S}{w_H} > 0$ denotes the relative wage of Source workers. The firm thus balances the difference in costs of capital resulting from a disparity in institutional quality against the difference in labor costs. For given λ and ω, the sign of z and resulting pattern of FDI and trade differ by sector.

Consider a specific case when labor costs in Source are higher than in Host – for instance, when Source is an industrialized economy, and Host is a developing country. In this case, $\omega > 1$. Then the following proposition holds:

Proposition 2: When $\omega > 1$, there exists a sector θ^* for which all firms in sectors $\theta > \theta^*, \theta \in (0;1)$ export from Source to Host ($z > 0$), and all firms in sectors $\theta < \theta^*, \theta \in (0;1)$ export from Host to Source ($z < 0$). This sector is defined as follows:

$\theta^* = 1$, if $\lambda \leq 1$; and

$\theta^* = \frac{\ln \omega}{\ln \lambda + \ln \omega}$, if $\lambda > 1$.

Proof: see Appendix A.

In other words, when labor costs in Host are lower than in Source, firms in sectors with capital intensity below θ^* export from Host to Source ($z < 0$); firms in sectors with capital intensity above θ^* export from Source to Host ($z > 0$). The quantity of each variety that is exported is inversely related to the trade cost t. Higher exports (or lower imports) require more production in that sector, and are thus associated with greater capital use and higher FDI.

The actual effect of trade on the composition of FDI depends on Host's institutions. Specifically, for $\lambda \leq 1$, we have $\theta^* = 1$. For $\lambda > 1$, the shape of θ^* is described as follows:

Proposition 3: For $\lambda > 1$, θ^* is a positive, decreasing, convex function of λ which equals 1 at $\lambda = 1$ and approaches zero as λ approaches infinity

Proof: see Appendix A.

Plotting θ^* against λ yields the following graph:

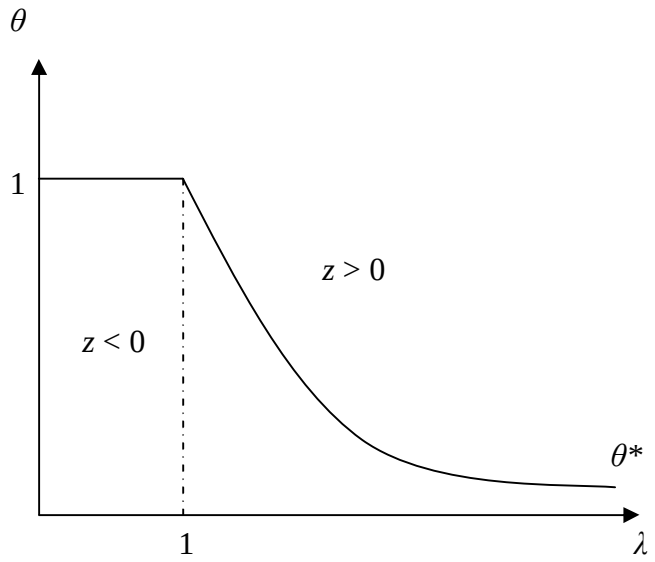

Figure 1: θ^* **as a function of** λ

5.2. Patterns of Trade and FDI

The results show that, if $\lambda \leq 1$ (i.e. Host has lower labor costs and better institutions), all of Host's sectors export when trade is allowed. Hence, each sector produces more than in autarky, and receives more FDI. Further liberalization of trade (i.e. reduction in *t*) increases FDI inflows in every sector. Intuitively, this happens because Host offers both low wages and superior institutional environment, compared to Source.

On the other hand, if $\lambda > 1$ (i.e. Host is a country with low labor costs but deficient institutions), Host imports capital-intensive goods, while its exports are biased towards less capital-intensive sectors. On the intuitive level, this is explained by the fact that Host has cheaper labor but its institutional flaws make capital use more costly. Liberalization of trade increases FDI inflows into labor-intensive export sectors and reduces foreign investment into capital-intensive sectors.

Overall, liberalization of trade increases the magnitude of the effects observed in Chapter 3. This happens because as trade costs – which serve as forces of dispersion – go down, it becomes more efficient for a firm to concentrate production in a country where a particular factor is cheaper. Consequently, the lower the trade costs are, the larger is the effect of institutional quality on the economy. If trade is restricted, capital-intensive firms would still invest comparatively much into an economy with poor institutions, because of a need to serve the local market. But when the costs of trade are low, firms can import the products instead of producing them locally, and capital-intensive industries invest less into the country with low institutional quality. Conversely, labor-intensive firms, which are less sensitive to institutional problems, invest more to take advantage of the low labor costs.

The relationship between FDI and trade thus differs between industries and depends on whether an industry's capital intensity is above or below θ^*. In industries where $\theta < \theta^*$, the relationship between labor costs and institutional quality gives the host country a comparative advantage, and trade complements FDI, since low trade costs allow foreign firms to produce goods in the host country for export. On the other hand, in industries where $\theta > \theta^*$ and the host country is at a disadvantage, trade substitutes FDI as a strategy of choice for firms willing to enter the market.

In this model, differences in relative wage and institutional quality become a source of specialization in trade. Note that even though the model is set in a two-factor framework, and even though cross-border investment eventually brings more capital to the country that exports capital services, the logic of the model developed in this thesis functions differently from that of the Heckscher-Ohlin-Vanek model of trade. Rather than arising from differences in factor endowments, specialization in this model is generated by exogenous differences in relative factor prices caused by a disparity in institutional environment.

Institutional reforms in a (developing) host country – interpreted here as a reduction in λ – change the pattern of specialization by raising the corresponding cutoff level of capital intensity θ^*. By enhancing institutions, a developing country can make its capital-intensive sectors more competitive. This encourages foreign firms to use that country to produce goods for foreign markets. Consequently, by improving institutional quality, a developing country can diversify into sectors with higher capital intensity.

6. CONCLUDING REMARKS

This thesis developed a model examining the effect of institutions on foreign direct investment decisions and the composition of FDI. The crucial idea underpinning the model was the assumption that institutional problems serve as an extra cost of using capital, entering profit equation in a manner akin to that of capital taxes. This assumption was based on a number of previous studies. Other elements of the model, such as Cobb-Douglas production function and CES utility, were fairly conventional.

The model generated two results. First, it predicted that weaknesses in a country's institutional environment reduce incoming FDI. Second, it concluded institutional quality is positively related to the share of capital intensive sectors in overall FDI inflows. Analysis of empirical data gave strong support to both predictions

Overall, results generated by the baseline model suggest a greater role for institutions in economic development than previously proposed. While it has been largely acknowledged that institutions are directly related growth, and that the quality of various institutional parameters positively influences the *amount* of foreign direct investment, this study concluded that institutions can also affect the *structure* of FDI. By reducing the cost of utilizing capital, improvement in institutions have a particularly strong effect on capital-intensive industries. If attracting capital-intensive FDI is a policy goal (for example, if capital-intensive sectors present greater opportunities for transfer of knowledge), institutional reforms should receive an even greater emphasis.

The basic model was further extended to take international trade into consideration. It was shown that institutional differences give rise to a pattern of specialization under which a developing country with a flawed institutional environment tends to export labor-intensive products and import capital-intensive goods. Compared to the case with no trade, low

institutional quality makes FDI even more biased towards labor-intensive sectors, as trade makes it possible for firms to decide on the location of production facilities based on labor costs and institutions, rather than on local demand.

Consequently, if trade is liberalized, a poor country with low institutional quality becomes even more specialized, as FDI into, and production in, labor-intensive sectors grows, while investment into capital-intensive sectors falls. The point separating the sectors that gain FDI from trade liberalization from the sectors that lose it depends on institutional quality. Hence, countries with better institutions can be expected to receive greater gains, and to incur fewer losses, if trade is liberalized.

Welfare effects of liberalization are unclear, since changes in income levels were not analyzed and parameters such as wages were assumed to be fixed. However, it can be safely concluded that trade liberalization should proceed hand in hand with institutional improvement if a developing country wishes to avoid potentially painful reallocations and a loss of industries. Furthermore, by strengthening institutions, a developing country can diversify into capital-intensive sectors that it previously did not have. Finally, for a country with low labor costs and well-developed institutions, trade liberalization can be a way increasing FDI inflows into all sectors.

Compared to previous research, the model outlined in this study suggested a more complicated relationship between trade and FDI. Whereas previous studies have often concluded that trade is a substitute to horizontal FDI and a complement to vertical FDI, this analysis, which focused on horizontal FDI only, predicted that for a developing country, FDI acts as a substitute to trade in capital intensive sectors, and as a complement to trade in labor intensive industries, while the point that separates the former from the latter depends on institutional quality.

Future research can examine the link between FDI, trade, and institutions more closely. Due to data availability issues and other limitations, this study did not attempt to test empirically the extended version of the model. Hence, subsequent research can try to determine whether developing countries with low quality of institutions tend to export labor-intensive goods, and whether free trade magnifies the effect of institutions on FDI.

APPENDIX A: PROOFS

Proof of Proposition 1

Profit maximization yields the following first order conditions:

$$\rho\theta Y_S Q_S{}^{-\rho}\left(K_S{}^{\theta}L_S{}^{1-\theta}-z\right)^{\rho-1}K_S{}^{\theta-1}L_S{}^{1-\theta}=1 \tag{1.1}$$

$$\rho(1-\theta)Y_S Q_S{}^{-\rho}\left(K_S{}^{\theta}L_S{}^{1-\theta}-z\right)^{\rho-1}K_S{}^{\theta}L_S{}^{-\theta}=w_S \tag{1.2}$$

$$\rho\theta Y_H Q_H{}^{-\rho}\left(K_H{}^{\theta}L_H{}^{1-\theta}+z\right)^{\rho-1}K_H{}^{\theta-1}L_H{}^{1-\theta}=\lambda \tag{1.3}$$

$$\rho(1-\theta)Y_H Q_H{}^{-\rho}\left(K_H{}^{\theta}L_H{}^{1-\theta}+z\right)^{\rho-1}K_H{}^{\theta}L_H{}^{-\theta}=w_H \tag{1.4}$$

$$-\rho Y_S Q_S{}^{-\rho}\left(K_S{}^{\theta}L_S{}^{1-\theta}-z\right)^{\rho-1}+\rho Y_H Q_H{}^{-\rho}\left(K_H{}^{\theta}L_H{}^{1-\theta}+z\right)^{\rho-1}=2tz \tag{1.5}$$

By rearranging (1.1), we obtain:

$$\rho Y_S Q_S{}^{-\rho}\left(K_S{}^{\theta}L_S{}^{1-\theta}-z\right)^{\rho-1}=K_S{}^{1-\theta}L_S{}^{\theta-1}\theta^{-1}. \tag{2.1}$$

And similarly, from (1.3) we get:

$$\rho Y_H Q_H{}^{-\rho}\left(K_H{}^{\theta}L_H{}^{1-\theta}-z\right)^{\rho-1}=\lambda K_H{}^{1-\theta}L_H{}^{\theta-1}\theta^{-1}. \tag{2.2}$$

Furthermore, dividing (1.2) by (1.1), we obtain:

$$\frac{1-\theta}{\theta}\frac{K_S}{L_S}=w_S\ .$$

And hence,

$$K_S{}^{1-\theta}L_S{}^{\theta-1}=\left(w_S\frac{\theta}{1-\theta}\right)^{1-\theta}. \tag{2.3}$$

And similarly, dividing (1.4) by (1.3), we get:

$$\frac{1-\theta}{\theta}\frac{K_H}{L_H}=\frac{w_H}{\lambda}.$$

And hence,

$$K_H^{1-\theta} L_H^{\theta-1} = \left(\frac{w_H}{\lambda} \frac{\theta}{1-\theta} \right)^{1-\theta} \tag{2.4}$$

Combining (2.1) and (2.3) yields:

$$\rho\theta Y_S Q_S^{-\rho} \left(K_S^{\theta} L_S^{1-\theta} - z \right)^{\rho-1} = \left(w_S \frac{\theta}{1-\theta} \right)^{1-\theta} \theta^{-1} \tag{3.1}$$

At the same time, combining (2.2) and (2.4) gives:

$$\rho\theta Y_H Q_H^{-\rho} \left(K_H^{\theta} L_H^{1-\theta} - z \right)^{\rho-1} = \lambda \left(\frac{w_H}{\lambda} \frac{\theta}{1-\theta} \right)^{1-\theta} \theta^{-1} \tag{3.2}$$

Plugging (3.1) and (3.2) into (1.5) gives the following equation:

$$-\left(w_S \frac{\theta}{1-\theta} \right)^{1-\theta} \theta^{-1} + \lambda^{\theta} \left(w_H \frac{\theta}{1-\theta} \right)^{1-\theta} \theta^{-1} = 2tz \tag{4}$$

After rearranging, (4) turns into:

$$\frac{1}{\theta^{\theta}(1-\theta)^{1-\theta}} \left(\lambda^{\theta} w_H^{1-\theta} - w_S^{1-\theta} \right) = 2tz \,,$$

which is equivalent to Proposition 1.

Proof of Proposition 2

We know that $z > 0$ if and only if $\lambda^{\theta} > \left(\frac{w_S}{w_H} \right)^{1-\theta} \equiv \omega^{1-\theta}$. Taking logs of both sides of that condition and rearranging, we obtain:

$$\theta(\ln\lambda + \ln\omega) > \ln\omega \,.$$

Taking into account the conditions $\theta > 0$ and $\theta < 1$ and assuming that $\ln\lambda + \ln\omega = 0$ (see below), the inequality above is equivalent to the following system:

$$\begin{cases} \theta > \dfrac{\ln\omega}{\ln\lambda + \ln\omega}, \text{ iff } \ln\lambda + \ln\omega > 0 \,;\, 0 < \theta < 1. \\ \theta < \dfrac{\ln\omega}{\ln\lambda + \ln\omega}, \text{ iff } \ln\lambda + \ln\omega < 0 \,;\, 0 < \theta < 1. \end{cases}$$

We know that $\omega > 1$ and thus $\ln \omega > 0$. There are five relevant intervals for λ:

1. $\lambda < 1/\omega < 1$. Then, $\ln \lambda < -\ln \omega$, and hence $\ln \lambda + \ln \omega < 0$. Consequently, $\frac{\ln \omega}{\ln \lambda + \ln \omega} < 0$, and thus the system of inequalities above (specifically, $\theta > 0$) does not hold. Hence, $z \le 0, \forall \theta \in (0;1)$, and therefore, $\theta^* = 1$.

2. $\lambda = 1/\omega < 1$. Then, $\ln \lambda = -\ln \omega$, and hence $\ln \lambda + \ln \omega \neq 0$. Since $\ln \omega > 0$, the condition $\theta(\ln \lambda + \ln \omega) > \ln \omega$ cannot hold. Hence , $z \le 0, \forall \theta \in (0;1)$, and therefore, $\theta^* = 1$.

3. $1/\omega < \lambda < 1$. Then, $-\ln \omega < \ln \lambda < 0$, and hence $0 < \ln \lambda + \ln \omega < \ln \omega$. Consequently, $\frac{\ln \omega}{\ln \lambda + \ln \omega} > 1$, and thus the system of inequalities above (specifically, $\theta < 1$) does not hold. Hence, $z \le 0, \forall \theta \in (0;1)$, and therefore, $\theta^* = 1$.

4. $1/\omega < \lambda = 1$. Then, $\ln \lambda + \ln \omega = \ln \omega > 0$. Consequently, $z > 0$ iff $\theta > \frac{\ln \omega}{\ln \lambda + \ln \omega} = 1$. Since this never holds, $z \le 0, \forall \theta \in (0;1)$, and therefore, $\theta^* = 1$.

5. $1/\omega < 1 < \lambda$. Then, $\ln \lambda > 0$, and hence $\ln \lambda + \ln \omega > \ln \omega$. Consequently, $0 < \frac{\ln \omega}{\ln \lambda + \ln \omega} < 1$, and thus the system of inequalities above holds iff $\theta > \frac{\ln \omega}{\ln \lambda + \ln \omega}$. Hence, $z > 0$ iff $\theta > \frac{\ln \omega}{\ln \lambda + \ln \omega}$. Furthermore, since, $\frac{\ln \omega}{\ln \lambda + \ln \omega} \in (0,1)$ and θ is continuous between 0 and 1, there exists θ^* such that $\theta^* = \frac{\ln \omega}{\ln \lambda + \ln \omega}$

Proof of Proposition 3

Since $\lambda > 1$ and $\omega > 1$, both $\ln\lambda$ and $\ln\omega$ are positive. Hence $\theta^* = \theta^*(\lambda) = \dfrac{\ln \omega}{\ln \lambda + \ln \omega}$ is positive for all $\lambda > 1$. Furthermore, as λ approaches infinity, $\ln\lambda$ also approaches infinity, and $\theta^*(\lambda)$ thus approaches zero.

Taking the first derivative of $\theta^*(\lambda)$ yields:

$$\frac{d\theta^*}{d\lambda} = -\frac{\ln \omega}{\lambda(\ln \lambda + \ln \omega)^2} < 0$$

Thus, $\theta^*(\lambda)$ is decreasing in λ

Taking the second derivative yields:

$$\frac{d^2\theta^*}{d\lambda^2} = \frac{\ln \omega}{\lambda^2(\ln \lambda + \ln \omega)^4}\left[(\ln \lambda + \ln \omega)^2 + 2(\ln \lambda + \ln \omega)\right] > 0$$

Therefore, $\theta^*(\lambda)$ is convex in λ.

APPENDIX B: DATA

Table 2: List of Source Countries

Bulgaria	Finland	Italy	Netherlands	Slovenia
Cyprus	France	Latvia	Poland	United Kingdom
Czech Republic	Germany	Lithuania	Portugal	
Denmark	Hungary	Luxembourg	Romania	
Estonia	Ireland	Malta	Slovakia	

Table 3: List of Host Countries

Argentina	Estonia	Italy	Norway	South Korea
Australia	Finland	Ivory Coast	Paraguay	Spain
Austria	France	Japan	Philippines	Sweden
Belgium	Germany	Latvia	Poland	Switzerland
Brazil	Greece	Lithuania	Portugal	Taiwan
Bulgaria	Hong Kong	Luxembourg	Romania	Thailand
Canada	Hungary	Macedonia	Russia	Turkey
Chile	Iceland	Malaysia	Serbia	Ukraine
China	India	Mexico	Singapore	United Kingdom
Croatia	Indonesia	Morocco	Slovakia	United States
Czech Republic	Iran	Netherlands	Slovenia	Uruguay
Denmark	Ireland	New Zealand	South Africa	Venezuela
Egypt	Israel	Nigeria		

Table 4: List of Industries

Industry Name	**Capital Intensity**
Manufacture of food products, beverages, and tobacco products	0.425
Manufacture of textiles and wood products	0.318
Manufacture of petroleum, chemical, rubber and plastic products	0.442
Manufacture of metal and mechanical products	0.288
Manufacture of office machinery, computers, and radio, television and communication equipment	0.255
Manufacture of medical, precision and optical instruments, watches and clocks	0.286
Manufacture of vehicles and other transport equipment	0.151
Electricity, gas and water supply	0.632
Construction	0.362
Trade and repairs	0.421
Hotels and restaurants	0.346
Transport, storage and communication	0.451

APPENDIX C: EMPIRICAL RESULTS

Table 5: Regression Results

	(1)	(2)	(3)	(4)	(5)
Method	**OLS**	**OLS**	**OLS**	**OLS**	**Heckman**
Dependent variable	**Log(FDI)**	**Log(FDI)**	**Log(FDI)**	**Log(FDI)**	**Log(FDI)**
Quality of institutions	-0.011 (0.057)		-0.006 (0.059)		-0.019 (0.057)
Capital intensity	0.445 (0.559)	0.713 (0.518)			-0.094 (0.538)
Capital intensity * Quality of institutions	0.153 (0.084)*	0.192 (0.08)**	0.16 (0.078)**	0.183 (0.076)**	0.172 (0.074)**
Log (source country GDP)	2.944 (0.272)***		3.106 (0.3)***		2.287 (0.245)***
Log (host country GDP)	0.782 (0.197)***		0.799 (0.222)***		0.649 (0.204)***
Log (source country population)	-2.278 (0.255)***		-2.413 (0.282)***		-1.838 (0.222)***
Log (host country population)	-0.226 (0.182)		-0.207 (0.212)		-0.179 (0.186)
Log (geographical distance)	-0.55 (0.107)***	-0.741 (0.14)***	-0.6 (0.116)***	-0.857 (0.144)***	-0.444 (0.101)***
Shared border	0.238 (0.225)	0.054 (0.208)	0.333 (0.235)	0.115 (0.221)	0.113 (0.222)
Shared official language	0.27 (0.402)	-0.211 (0.442)	0.224 (0.394)	-0.39 (0.462)	0.264 (0.365)
Shared language spoken by 9% of population	0.043 (0.296)	0.435 (0.403)	0.078 (0.274)	0.611 (0.418)	0.087 (0.245)
Formerly in the same state or colonial empire	0.784 (0.264)***	0.746 (0.256)***	0.875 (0.277)***	0.83 (0.265)***	0.619 (0.281)***
Both countries are EU members	-0.091 (0.232)	0.415 (0.604)	-0.115 (0.241)	-0.089 (0.683)	-0.017 (0.224)
Both countries were Comecon members	0.027 (0.189)	4.727 (0.579)***	0.004 (0.199)	4.516 (0.571)***	-0.031 (0.189)
Constant	-8.77 (1.435)***	1.749 (1.408)	-10.058 (1.49)***	2.612 (1.599)	-5.389 (1.342)***
Inverse Mills ratio					-0.939 (0.151)***
Host country dummies	No	Yes	No	Yes	No
Source country dummies	No	Yes	No	Yes	No
Industry dummies	No	No	Yes	Yes	No
Number of observations	1930	1930	1930	1930	1930
Adjusted R-squared	0.379	0.484	0.45	0.554	0.401

Note: * - significant at 10%; ** - significant at 5%; *** - significant at 1%. White heteroskedasticity-consistent standard errors are in parentheses. Standard errors are clustered by host country. The last column shows the second stage of Heckman estimation.

Table 6: Heckman Selection Equation

Method	Probit
Capital intensity * Quality of institutions	-0.005 (0.005)
Log (distance)	-0.067 (0.011)***
Shared border	0.054 (0.032)**
Shared official language	-0.001 (0.029)
Shared language spoken by 9% of population	0.066 (0.043)**
Formerly in the same state or colonial empire	0.137 (0.05)***
Both countries are EU members	0.021 (0.043)
Both countries were Comecon members	0.964 (0.055)***
Host country dummies	Yes
Source country dummies	Yes
Industry dummies	Yes
Number of observations	8047
Adjusted R-squared	0.653

Note: * - significant at 10%; ** - significant at 5%; *** - significant at 1%. White heteroskedasticity-consistent standard errors are in parentheses. Standard errors are clustered by host country.

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