mathematics

MDPI

Communication

The Nexus between Institutional Quality and Global Market Structure: Export versus FDI

Jaewon Jung [1,2,3]

[1] School of Business and Economics, Dankook University, Yongin 16890, Republic of Korea; jung@dankook.ac.kr
[2] THEMA, CY Cergy Paris University, 95011 Cergy, France
[3] School of Business and Economics, RWTH Aachen University, 52056 Aachen, Germany

Abstract: Though many important links between the productivity/resource differences of countries and their trade patterns have been highlighted by traditional trade theories, much less attention has been devoted to studying the role of institutional quality in global trade/investment patterns. To study this role, the present paper develops a two-country general equilibrium trade/FDI model that solves a complementarity problem with different firm types. Four different firm types—two types of national exporting firms and two types of multinational firms based in each country—compete in the global market and emerge endogenously. By incorporating multinational firms and country-specific institutional quality into the traditional factor endowment trade theory, this study investigates the impacts of institutional quality on the equilibrium global market structure (regime changes) in detail. The study shows that even a small variation in institutional quality can greatly affect the equilibrium of the global market structure in both magnitude and direction. In particular, multinational firms that have to incur higher fixed setup costs than national competitors are more influenced by country-specific institutional quality, and base their headquarter in countries with better institutional quality, which is not captured by traditional trade theories in which institutional quality factors are not considered.

Keywords: institutional quality; foreign direct investment (FDI); export; global market structure; regime change; multinational firms; general-equilibrium model; complementarity problem

MSC: 91B60

Citation: Jung, J. The Nexus between Institutional Quality and Global Market Structure: Export versus FDI. *Mathematics* **2022**, *10*, 4629. https://doi.org/10.3390/math10244629

Academic Editor: Manuel Alberto M. Ferreira

Received: 9 November 2022
Accepted: 3 December 2022
Published: 7 December 2022

1. Introduction

Exports and foreign direct investment (FDI) have been the two main driving forces of globalization. In many countries, government authorities have pursued a policy of promoting exports and attracting multinational activities for economic development and sustainable economic growth. Traditional trade theories have been developed to explain the reason of trade and the resulting trade patterns and gains from trade; more recently, emphasis has been placed on the activities of multinational firms and the role of firm heterogeneity in explaining the global economy.

Consequently, many systematic links between country-specific characteristics and market structure have been uncovered. For economic policy authorities, understanding the determinants of market structure (national and global) is particularly important, helping to make successful policy decisions. Typically, three types of FDI have been classified: (*i*) market-seeking FDI, (*ii*) resource-seeking FDI, and (*iii*) efficiency-seeking FDI. How multinational firms react to different country-specific characteristics and how global capital flows react are major concerns of policy makers.

Though many important links between the productivity/resource differences of countries and their trade patterns have been highlighted by traditional trade theories, much less attention has been devoted to studying the role of institutional quality in global

trade/investment patterns. By not considering the institutional quality factors, traditional trade theories implicitly assume that all countries have the same institutional quality levels and that there is no influence at all over firms' investment decisions. However, it is widely documented that countries differ greatly in their institutional quality and that such differences in institutional quality play an important role in the investment and foreign market entry decisions of firms. For any kind of FDI motive, country-specific institutional quality should be crucial when a multinational firm decides where to base their headquarter and build additional affiliate plants. Systematically studying the nexus between institutional quality and global trade/investment patterns in depth should be a research priority with respect to the contemporary globalization process.

Because institutional quality broadly indicates the overall quality of governance and institutions in a country, many factors are involved, simultaneously and interdependently influencing overall institutional quality. In many aspects, such institutional quality is closely related to the overall uncertainty prevailing in the country. Other conditions being equal, firms are highly reluctant to invest in a country having poor institutional quality, as poor institutional quality decreases the possibility of investment success. Traditional theories of investment under uncertainty have highlighted that a great deal of inertia (waiting) is optimal when dynamic decisions are being made in an uncertain environment, on account of the irreversible nature of investment. In terms of modeling, poor institutional quality and high uncertainty generate very similar effects on the investment decision of firms, with both leading to less investment.

Institutional quality is a broad concept that includes various social, political, and economic factors. For example, the Worldwide Governance Indicators (WGI) of the World Bank, which is one of the most widely used proxy for institutional quality of countries, reports on six broad dimensions of governance: (*i*) voice and accountability, (*ii*) political stability and absence of violence/terrorism, (*iii*) government effectiveness, (*iv*) regulatory quality, (*v*) rule of law, and (*vi*) control of corruption [1]. All these dimensions are in turn closely related to overall social, political, and economic uncertainty. Though there should of course be various factors influencing foreign investments, such as exchange rate, market size, preferential trade agreements, etc., comparative static analysis investigating the possible links between institutional quality and trade/investment patterns would be of great interest.

The aim of this paper is to highlight the nexus between institutional quality and global market structure. This study develops a two-country general-equilibrium trade model in which country-specific institutional quality level plays an important role in firms' market entry and exit decision-making. Four types of firms—two types of national exporting firms and two types of multinational firms based in each country—may coexist and compete in the global market. To enter the foreign market, individual firms face the proximity–concentration tradeoff. Exporting goods to a foreign market is associated with trade costs per unit of goods shipped, while building an additional affiliate plant in a foreign market may require additional fixed setup costs to operate in the foreign country. The country-specific fixed setup costs are dependent on the country-specific institutional quality. Poor institutional quality is associated with higher investment risks, increasing the fixed setup costs incurred in that country.

With this basic setup, the present study investigates the impacts of institutional quality on the equilibrium global market structure in detail. The model solves the complementarity problem, in which the emergence of each firm type is endogenous, for individual firms. In particular, the emergence of each firm type is investigated in a detailed Edgeworth box in which global endowments are distributed between two countries by step changes of 5 percent. By comparison with the benchmark case, this study shows how small variations in institutional quality in a country greatly change the equilibrium of the global market structure. A small deterioration of institutional quality in a country leads to a significant exit of firms from that country, while inducing a large entry of firms in the other country. This is particularly the case for multinational firms, which have to incur higher fixed setup

costs than national exporting firms. Even with a small deterioration of institutional quality in a country, multinational firms change their headquarter to the other country.

The rest of the paper is organized as follows. Section 2 discusses the related literature. In Section 3, the basic setup of the model written in complementary slackness form is presented. Section 4 presents a parameterized general-equilibrium model and shows the benchmark equilibrium regimes. In Section 5, the impacts of institutional quality on the equilibrium regimes are investigated. Section 6 provides a brief discussion and concluding remarks.

2. Related Literature

Institutional quality is a broad concept including various social, political and economic factors. In a broad sense, it can be defined as any devised constraints that shape the interactions between agents, including any formal and informal rules of the game (see, e.g., [2–7]). From an individual perspective, it may concern the rights and opportunities of the members in the social and economic system (see, e.g., [8,9]). With such a broad concept, it has been widely recognized that institutions are latent factors within the social and economic system, which makes it hard to find one appropriate proxy. For this reason, composite indicators combining various dimensions, such as the Worldwide Governance Indicators (WGI) of the World Bank, have been constructed and widely used to measure the institutional quality of countries.

On the empirical side, the impact of institutional quality on overall economic performance has frequently been investigated. One widely documented channel is through FDI flows. There is now an abundant literature on the positive relationship between FDI and economic development/growth (see, e.g., [10–15]). Many various factors have been identified as determinants of FDI flows, and recent FDI literature has paid particular attention to institutional quality channels, such as financial markets (see, e.g., [16–18]). Many studies have now investigated the links between the institutional quality and FDI, and a broad set of institutional variables has been tested and emphasized. For example, Wei [19] has shown a significantly negative impact of corruption on FDI inflows. Buchanan et al. [20] highlighted the negative relationship between good institutional quality and FDI volatility. Benassy-Quere et al. [21] have shown that the institutional distance between countries reduces bilateral FDI flows. Other researchers have highlighted the importance of property rights to attracting FDI (see, e.g., [22–24]). On the other hand, given the various dimensions of institutional quality, other researchers have examined the impact of composite measures of institutional quality on FDI. Among others, Gani [25] has shown that FDI is positively correlated with rule of law, control of corruption, regulatory quality, government effectiveness, political stability, etc. Daude and Stein [26] emphasize, among others, unpredictability of law, regulations, and policies, excessive regulatory burden, government instability, and a lack of commitment, while Jensen [27] emphasizes in particular the importance of political factors in attracting FDI.

In many aspects, institutional quality is closely related to uncertainty. In particular, researchers have focused on the political dimension of institutional quality. Among others, Julio and Yook [28] have shown that political uncertainty during election periods significantly deters foreign investment and that the impact of political uncertainty on FDI flows depends on the level of institutional quality. The negative impact of political risk (uncertainty) on FDI flows has been identified; see, e.g., [29–34]. Related to this literature, Hermes and Lensink [35] have highlighted a positive relationship between political uncertainty and the outflow of domestic capital. Dixit [36] concluded that FDI may be the most sensitive to political uncertainty and institutions.

Thus, the institutional quality of a country or region may reflect the overall degree of uncertainty in that country or region. Firms are in general very reluctant to invest under any kind of uncertainty, and avoid countries and regions with lower institutional quality. Such behaviors and the induced implications have largely been explored in the literature of investment under uncertainty. When dynamic decisions are being made in

an uncertain environment, a great deal of inertia (waiting) is optimal for investors (firms) (see, e.g., [37–42]). In addition, a collection of studies have focused on the effects of political and policy uncertainty on firms' investment decisions (see, e.g., [43–47]). The key point with respect to investment inertia is the irreversible nature of investment (see, e.g., [48–51]). Thus, in a sense, uncertainty acts as a tax on investment. The present study incorporates the uncertainty dimension of institutional quality into the traditional trade theory (see, e.g., [52–57]) and contributes to the literature by showing the nexus between country-specific institutional quality and international trade/FDI patterns (endogenous global market structure).

3. The Model

In this section, a general-equilibrium trade model composed of a system of inequalities is developed. Each inequality is associated with a non-negative variable to be solved, which is referred to as a complementarity problem in mathematical programming. As shown below, firms may choose different strategies to enter foreign markets and different firm types emerge endogenously, which leads to different equilibrium regimes. In particular, this study focuses on the proximity-concentration tradeoff faced by firms. With this modeling approach, the model is able to consider horizontal FDI in manufacturing sectors between developed countries, which has mainly driven the world's FDI flows during the last decades (see, e.g., [58–60]).

3.1. Preferences

The world in this sense is composed of two countries (or regions) $\{i, j\}$. Each country produces two goods Y and X. Consumers in both countries have Cobb–Douglas preferences over the two goods:

$$U = Y^{\alpha} X^{\beta}, \tag{1}$$

with the corresponding respective demands:

$$Y = \alpha \frac{Inc}{P_Y} \text{ and } X = \beta \frac{Inc}{P_X}. \tag{2}$$

While Y goods are homogeneous, X goods are differentiated at the individual firm level, that is, Y industry is the outside numeraire good sector, while X industry is the main focus of the analysis. Consumers have Dixit–Stiglitz preferences over a continuum of varieties:

$$X = \left[\int_{n \in N} x(n)^{\rho} dn \right]^{\frac{1}{\rho}}, \tag{3}$$

with $0 < \rho < 1$. N represents the mass of available varieties and the index n denotes individual varieties. As usual, the consumer's optimization yields the demand schedule for each variety associated with an aggregate price index P_X:

$$x(n) = \left(\frac{p(n)}{P_X} \right)^{-\sigma} X, \tag{4}$$

$$P_X = \left[\int_{n \in N} p(n)^{1-\sigma} dn \right]^{\frac{1}{1-\sigma}}, \tag{5}$$

where $\sigma = 1/(1-\rho)$ is the elasticity of substitution between varieties and $p(n)$ is the market price for each variety.

3.2. Production and Firms

Y is produced by a competitive industry with constant returns to scale, and freely traded between countries. There are two factors of production. Each country is endowed with given quantities of skilled labor $\overline{S}$ and of a fixed composite factor $\overline{L}$ which includes

unskilled labor. The model assumes that S is employed in both industries, whereas L is specific to the Y industry. Thus, expansion of X industry draws more skilled labor from Y industry, which adds convexity to the model. For industry Y, a CES production function is assumed:

$$Y = \left[\alpha_Y L_Y^{\rho_Y} + \beta_Y S_Y^{\rho_Y}\right]^{\frac{1}{\rho_Y}}. \tag{6}$$

The producer's optimization yields the demand schedule for each factor associated with an aggregate price index P_Y:

$$L_Y = \widetilde{\alpha}_Y \left(\frac{P_Y}{w_L}\right)^{\sigma_Y} Y \text{ and } S_Y = \widetilde{\beta}_Y \left(\frac{P_Y}{w_S}\right)^{\sigma_Y} Y \tag{7}$$

$$P_Y = \left[\widetilde{\alpha}_Y w_L^{1-\sigma_Y} + \widetilde{\beta}_Y w_S^{1-\sigma_Y}\right]^{1/(1-\sigma_Y)}, \tag{8}$$

where $\widetilde{\alpha}_Y = \alpha_Y^{\sigma_Y}$ and $\widetilde{\beta}_Y = \beta_Y^{\sigma_Y}$, $\sigma_Y = 1/(1-\rho_Y)$ is the elasticity of substitution between production factors, and w_L and w_S are factor prices and wage rates, respectively.

Assuming a monopolistic competition to prevail in X industry, firms charge a constant markup over marginal production costs:

$$p_i = \frac{\sigma}{\sigma - 1} w_{si} c \text{ and } p_j = \frac{\sigma}{\sigma - 1} w_{sj} c \tag{9}$$

where c is the constant marginal production cost in efficiency units of skilled labor.

Firms in industry X have two options to serve a foreign market: exporting or building a branch plant in the foreign country. Exporting X goods to the foreign market is associated with iceberg trade costs $\tau > 1$ per unit, while building a branch plant in the foreign country incurs addition fixed setup costs. Two different firm types may arise in each country: domestic exporting firms (indexed by d) and multinational firms engaging in horizontal FDI (indexed by h). Consequently, consumers in country i have demands for each variety, as follows:

$$x_{ii}^d = x_{ii}^h = x_{ji}^h = \left(\frac{p_i}{P_{Xi}}\right)^{-\sigma} X_i \text{ and } x_{ji}^d = \tau^{1-\sigma}\left(\frac{p_j}{P_{Xi}}\right)^{-\sigma} X_i \tag{10}$$

where x_{ii}^d, x_{ii}^h, x_{ji}^h, and x_{ji}^d are X goods produced by domestic firms of country i, multinational firms based in country i, multinational firms based in country j and having a branch plant in country i, and country j domestic firms exporting to country i, respectively. The aggregate consumption price index (5) can be written as follows:

$$P_{Xi} = \left[N_i^d {p_i}^{1-\sigma} + N_j^d \left(\tau p_j\right)^{1-\sigma} + N_i^h {p_i}^{1-\sigma} + N_j^h {p_i}^{1-\sigma}\right]^{\frac{1}{1-\sigma}}, \tag{11}$$

where N_i^d, N_j^d, N_i^h, and N_j^h indicate the number of each firm type. The same demands can be derived for consumers in country j.

On the other hand, production requires fixed setup costs according to the chosen strategies. To enter the market, all firms have to pay a firm-specific fixed setup cost f_f and plant-specific fixed costs f_p for each plant they build. Thus, domestic exporting firms incur $f_f + f_p$ in their home country, whereas multinational firms having separate production plants in each country incur $f_f + f_p + f_p$, which are measured in units of skilled labor S.

3.3. Country-Specific Institutionial Quality and Investment Costs

Institutional quality indicates the overall quality of governance and institutions in a country, and in many aspects is closely related to the overall uncertainty prevailing in the country. For example, political uncertainty interacts with institutional quality to influence the overall attractiveness of countries for foreign investment [28]; typically, corruption increases uncertainty, deterring investment by firms [26]. This is particularly the case for firms that make foreign market entry decisions. Firms are very reluctant to invest under

any kind of uncertainty, and consequently the equilibrium market structure should be highly dependent on country-wide uncertainty and/or institutional quality [61].

The theory of investment under uncertainty suggests that a great deal of inertia (waiting) is optimal when dynamic decisions are being made in an uncertain environment, because of the irreversible nature of investment and the gradual arrival of information over time. Dixit [38] derives the positive value of waiting. The investment trigger under uncertainty is $\gamma/(\gamma-1)$ times the Marshallian investment trigger $H = \frac{\gamma}{\gamma-1}M$, where γ depends on the discount rate δ and the volatility (uncertainty) of the revenue v:

$$\gamma = \frac{1}{2}\left[1 + \sqrt{1 + \frac{8\delta}{v^2}}\right] > 1. \tag{12}$$

Having in mind that poor institutional quality is associated with higher investment risk, the model introduces the uncertain nature of investment costs into the model. Specifically, the following are assumed:

$$f_{pi} = \frac{\gamma_i}{\gamma_i - 1} f_{pi}^0 \text{ and } f_{fi} = \frac{\gamma_i}{\gamma_i - 1} f_{fi}^0 \tag{13}$$

$$f_{pj} = \frac{\gamma_j}{\gamma_j - 1} f_{pj}^0 \text{ and } f_{fj} = \frac{\gamma_j}{\gamma_j - 1} f_{fj}^0 \tag{14}$$

where f_p and f_f are the institutional quality-adjusted plant-specific and firm-specific fixed setup costs, respectively. Note that these costs depend on the country-specific institutional quality (uncertainty) levels; an increase of v (lower institutional quality/higher uncertainty) in a country leads to higher fixed setup costs in that country, while a decrease of v (higher institutional quality/lower uncertainty) yields lower fixed setup costs.

3.4. Equilibrium

Firms are free to enter the market. Free entry ensures zero profit for all firm types if active, meaning that markup revenues exactly cover the fixed setup costs. The following four zero-profit conditions determine the equilibrium number of each firm type N_i^d, N_j^d, N_i^h, and N_j^h, respectively:

$$p_i x_{ii}^d + p_i x_{ij}^d \le w_{Si} c x_{ii}^d + w_{Si} c x_{ij}^d + w_{Si}\left(f_{pi} + f_{fi}\right) \tag{15}$$

$$p_j x_{jj}^d + p_j x_{ji}^d \le w_{Sj} c x_{jj}^d + w_{Sj} c x_{ji}^d + w_{Sj}\left(f_{pj} + f_{fj}\right) \tag{16}$$

$$p_i x_{ii}^h + p_j x_{ij}^h \le w_{Si} c x_{ii}^h + w_{Sj} c x_{ij}^h + w_{Si}\left(f_{pi} + f_{fi}\right) + w_{Sj} f_{pj} \tag{17}$$

$$p_j x_{jj}^h + p_i x_{ji}^h \le w_{Sj} c x_{jj}^h + w_{Si} c x_{ji}^h + w_{Sj}\left(f_{pj} + f_{fj}\right) + w_{Si} f_{pi} \tag{18}$$

Equations (15)–(18) are written in complementary slackness form. If firm types are active with positive production, the relevant equations hold with equality (zero profits), whereas firms exit from the market if strict inequalities hold (negative profits).

From the assumption that L is specific to Y industry, the following labor market clearing condition determines the wage rate of w_L in each country (written in complementary slackness form):

$$\overline{L}_i \ge L_{Yi} \text{ and } \overline{L}_j \ge L_{Yj}. \tag{19}$$

Similarly, the wage rate of w_S in each country is determined by the labor market clearing condition, S (written in complementary slackness form):

$$\overline{S}_i \ge S_{Yi} + \left(c x_{ii}^d + c x_{ij}^d + f_{pi} + f_{fi}\right) N_i^d + \left(c x_{ii}^h + f_{pi} + f_{fi}\right) N_i^h + \left(c x_{ji}^h + f_{pi}\right) N_j^h \tag{20}$$

$$\overline{S}_j \geq S_{Yj} + \left(cx_{jj}^d + cx_{ji}^d + f_{pj} + f_{fj}\right)N_j^d + \left(cx_{jj}^h + f_{pj} + f_{fj}\right)N_i^h + \left(cx_{ij}^h + f_{pj}\right)N_i^h \quad (21)$$

where S_{Yi} and S_{Yj} are the skilled labor demands for industry Y in each country. Note that multinational firms have an affiliate plant in the foreign country too in order to meet the local demand. Thus, multinational firms based in country-i, N_i^h have skilled labor demands in country j, appearing in Equation (21) as $\left(cx_{ij}^h + f_{pj}\right)N_i^h$. Similarly, $\left(cx_{ji}^h + f_{pi}\right)N_j^h$ appears in Equation (20).

Y goods are homogeneous and freely traded, meaning that the price P_Y is determined by

$$Y_i + Y_j \geq \alpha_i \frac{Inc_i}{P_Y} + \alpha_j \frac{Inc_j}{P_Y}. \quad (22)$$

where P_Y is chosen as the numeraire.

Finally, national incomes follow from employment:

$$Inc_i = w_{Li}\overline{L}_i + w_{Si}\overline{S}_i \text{ and } Inc_j = w_{Lj}\overline{L}_j + w_{Sj}\overline{S}_j \quad (23)$$

To address the question of how a change in the country-specific institutional quality level affects the equilibrium regime and market structure, the following section presents a numerical exploration of a parameterized version of the model.

4. The Numerical General-Equilibrium Model

The model contains many dimensions and many inequalities. Changing a parameter value generally affects the strict inequality and equality conditions simultaneously. When traditional analytical solutions cannot be derived, numerical simulation methods have often been used in economics as well as other fields.

This section parameterizes the previously developed model to solve the nonlinear complementarity problem. The numerical model is solved using GAMS (General Algebraic Modeling System) software, which is widely used for various mathematical optimization problems as well as large-scale general equilibrium models [62]. The model is composed of 25 equations and 25 endogenous variables, which should be solved simultaneously in general equilibrium. Because the model contains many dimensions and inequalities that need to be solved simultaneously, traditional analytical methods are of limited use. The model, written as mixed complementarity problem (MCP), must solve corner solutions and regime shifts with discrete production decisions. One great advantage of using GAMS is the availability of appropriate solvers for each type of model. Here, the PATH solver is used to solve the MCP model.

The world is endowed with 1000 units of L and 3000 units of S, which are divided between countries i and j. The model is calibrated to the center of the Edgeworth box, and the two countries are symmetric, with identical endowments and market size. All benchmark prices are set to one as far as possible. On the other hand, essential parameter values are chosen from the literature. For example, the value of σ is chosen as 5.0, which implies that the markup of monopolistic firms, $1/\sigma$, is 20%. This in turn leads to p = 1.25 from Equation (9). Table 1 shows the benchmark parameter and variable values.

Initially, the model assumes that both countries have the highest institutional quality (zero uncertainty) with $v = 0.00$, meaning that $f_p = f_p^0$ and $f_f = f_f^0$. Multinational firms are associated with similarities in country size and in relative endowments. At the center of the Edgeworth box, only multinational firms are active: initially, there are ten multinational firms based in each country.

Holding all other parameter values constant, the model can then be solved by altering the distribution of the world factor endowments. Figure 1 shows the equilibrium regimes in the world Edgeworth box.

Table 1. Benchmark parameter and variable values.

α	β	σ	$\tilde{\alpha}_Y$	$\tilde{\beta}_Y$	σ_Y	c	τ	δ	v	f_p^0
0.50	0.50	5.00	0.50	0.50	3.00	1.00	1.35	0.05	0.00	5.00
f_f^0	$\bar{L}$	$\bar{S}$	Y	x_{ii}^d	x_{ii}^h	x_{ji}^h	x_{ji}^d	x_{jj}^d	x_{jj}^h	x_{ij}^h
10.00	500	1500	1000	40.00	40.00	40.00	12.04	40.00	40.00	40.00
x_{ij}^d	p	w_L	w_S	N_i^d	N_j^d	N_i^h	N_j^h	Inc	P_X	P_Y
12.04	1.25	1.00	1.00	0.00	0.00	10.00	10.00	2000	0.59	1.00

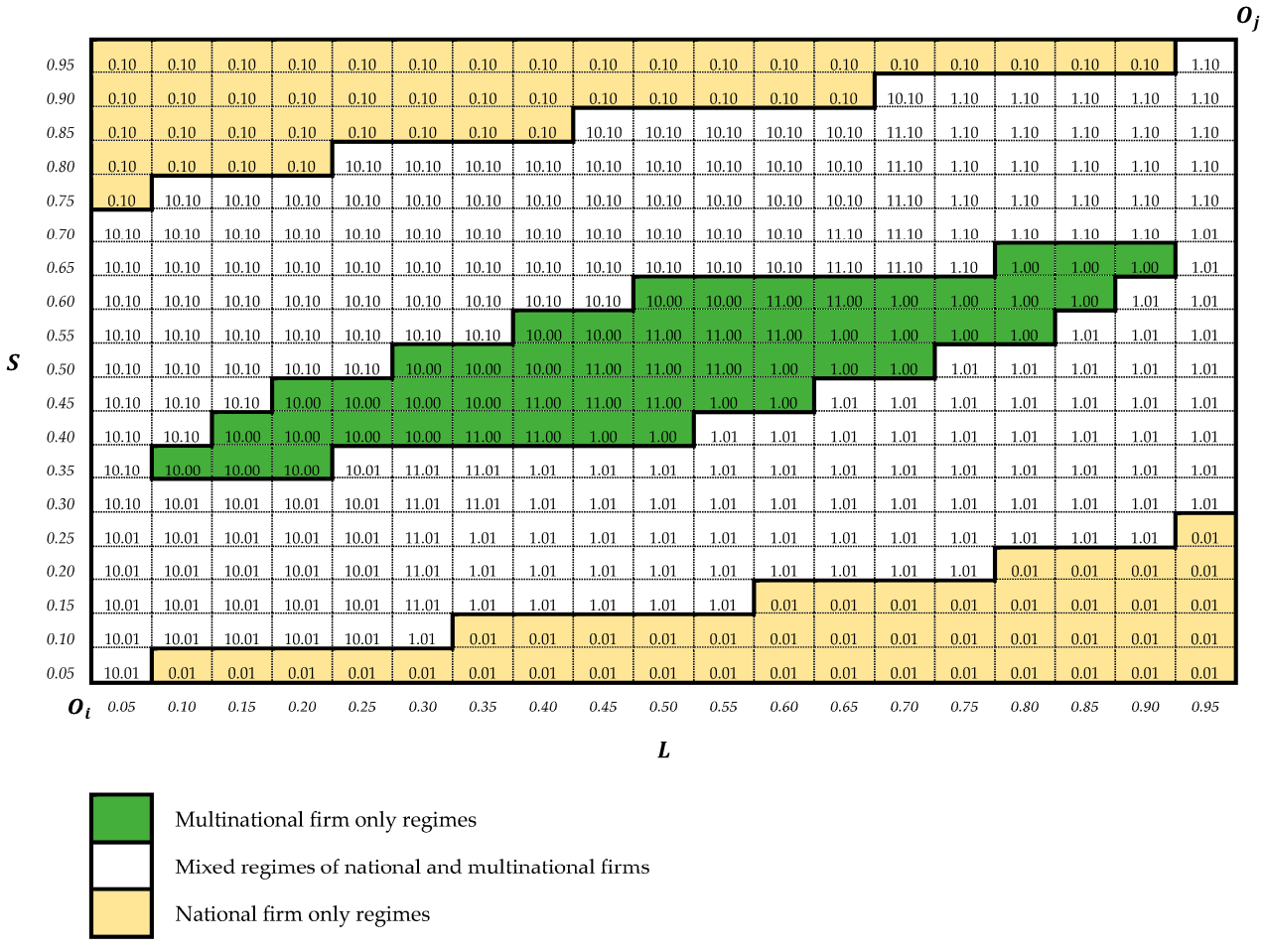

Figure 1. Equilibrium regimes (Benchmark).

In Figure 1, the vertical axis represents the total world endowment of skilled labor S and the horizontal axis represents the total world endowment of composite factor L. Country i is measured from the southwest corner (O_i), while country j is measured from the northeast corner (O_j). Any point within the box is a division of the world endowments between the two countries. The model can be solved repeatedly by altering the distribution of the world endowments in steps of 5 percent: for example, in the first cell at the southwest corner, country i is endowed with 5 percent of both the world's L and S, while country j is endowed with 95 percent of both the world's L and S.

The emergence of each firm type is indicated inside the box be the numbers {10, 1, 0.1, 0.01}, which are associated with $\{N_i^h, N_j^h, N_i^d, N_j^d\}$, respectively; for example, at the center of the Edgeworth box, where both countries have the same 50% of the world's endowments,

N_i^h and N_j^h are active (indicated by 11.00). In this way, Figure 1 shows all the solved equilibrium regimes. In general, three different areas may be distinguished:

- Multinational firm-only regimes (colored in green);
- Mixed regimes of national and multinational firms (colored in white);
- National firm-only regimes (colored in yellow).

It can be shown that only national firms are active at the edges of the box, while only multinational firms are active when both countries are similar in relative endowments and size. Between the two regions, there exist mixed regimes of both national and multinational firms. The study is based on a static general-equilibrium model which compares new equilibrium variable values following a parameter change with the benchmark values. Thus, it should be noted that the model does not explain any transitional dynamics of individual firms, such as whether new entries of multinational firms are from new investments or from the switching of national firms to multination firms, etc. The main focus of this study is on the comparative static analysis investigating the possible links between institutional quality and the equilibrium patterns of international trade and investment.

Remember that, thus far, the model has assumed $v = 0.00$ for both countries, that is, that the two countries are identical in institutional quality. The following section now investigates how differences in institutional quality changes the above equilibrium regimes.

5. Institutional Quality and the Equilibrium Regimes

This section investigates the nexus between country-specific institutional quality and global market structure. More specifically, for this simulation v_i is increased, while v_j is kept at the initial value, which implies that the institutional quality of country *i* becomes relatively poor compared to country *j*; similarly, this implies that the institutional quality of country *j* improves relative to country *i*.

Figures 2 and 3 present the new equilibrium regimes when $v_i = 0.2$ and $v_i = 0.4$, respectively, while $v_j = 0.0$. It can be observed that with even a small increase in v_i the equilibrium regimes are greatly changed. With an increase in v_i, the northwest region where only national firms are active is reduced, while the southeast region is enlarged. All else being equal, a deterioration of institutional quality in country *i* negatively affects the national firms of country *i*, while increasing the relative profitability of the national firms of country *j*. It is noteworthy that these effects grow larger with higher v_i.

It can be observed that an increase of v_i slightly reduces the middle region, where only multinational firms are active, and moves the region toward northeast. As before, these effects grow larger with higher v_i. A closer look at the cells reveals that multinational firms based in country *i* exit the market even with a small increase of v_i; it can be calculated that $v_i = 0.2$ increases fixed costs by more than 85% compared to the benchmark case. By building additional affiliate plants in the foreign market, multinational firms incur higher fixed costs than national competitors. Considering the large investment cost of multinational firms, overall institution quality should be one of the most important factors considered when they make decisions on where to base their headquarters.

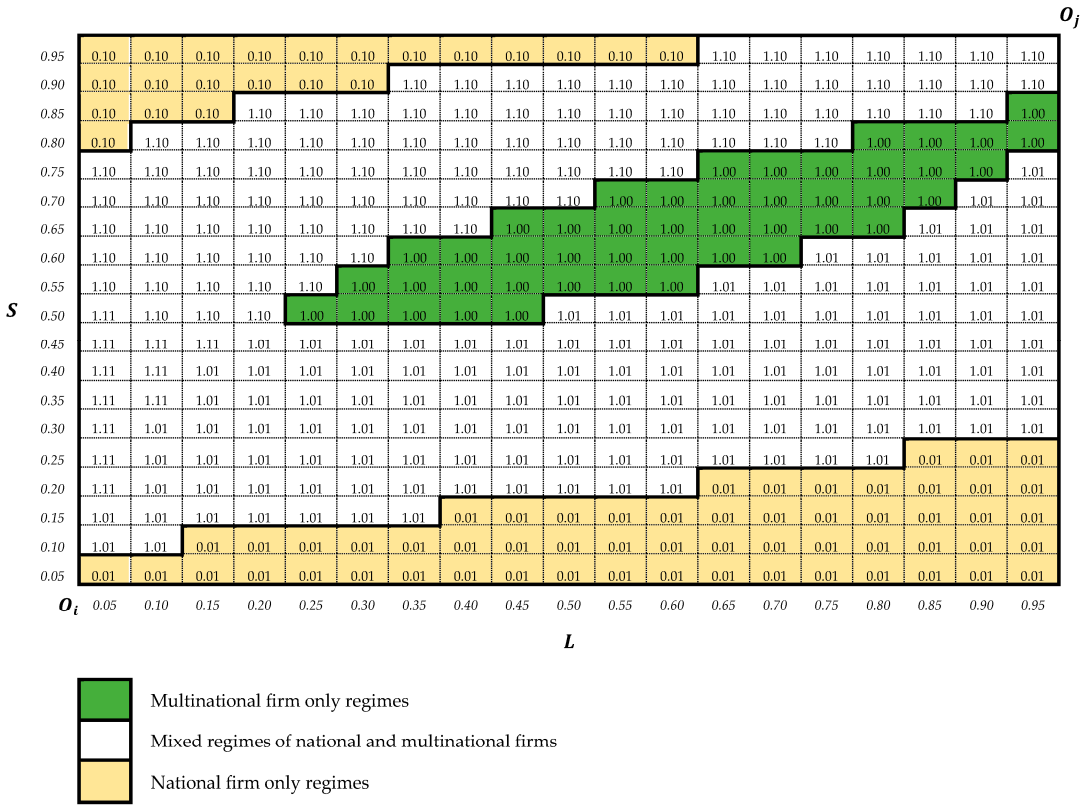

Figure 2. Equilibrium regimes ($v_i = 0.2$).

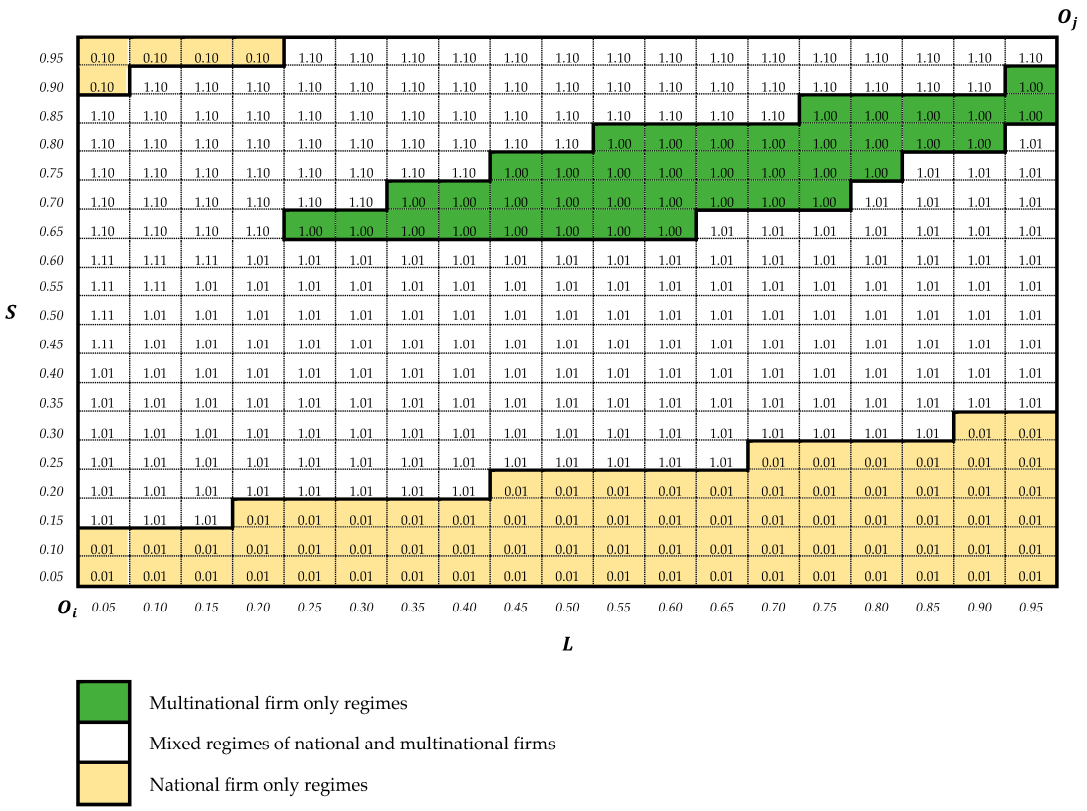

Figure 3. Equilibrium regimes ($v_i = 0.4$).

6. Discussion and Conclusions

It is now widely documented that firms are largely heterogeneous in their productivities and that there are systematic links between their productivity and their degree of internationalization; more productive firms self-select into foreign markets, and among those multinational firms are even more productive and use higher levels of technology than exporting firms (see, e.g., [63–69]). It has been widely reported that workers are heterogeneous in their skills and that globalization generates real productivity gains through assignment of skills to more efficient technologies (see, e.g., [70–77]). Furthermore, today's globalization process has been increasingly complexifying by including many different countries to form a global supply chain, and multinational firms and their global investment have been at the very core of such globalization processes and technology transfers (see, e.g., [78–80]). For these and other various reasons, in many countries government authorities seek to attract multinational activities by providing various incentives for multinational firms. Whether the policy objective is to attract multinational activities or to promote exports, the results of this paper highlight that institutional quality may be a crucial determinant for the global market structure.

Firms are generally very reluctant to invest under any kind of uncertainty; in particular, multinational firms tend to exhibit more risk-averse behavior due to the high sunk costs that they have to incur in foreign countries. When investment decisions are made in an uncertain environment, a great deal of inertia (waiting) is optimal for firms. Furthermore, many dimensions of institutional quality, such as political stability, reliable business environment, transparent government regulations, corruption, etc., are directly related to the overall uncertainty level perceived by firms, meaning that institutional quality may play an important role in the investment decisions of firms. For example, the overall improvement of institutional quality in China after its accession to the WTO has drastically increased FDI inflows to the country. In most Central and Eastern Europe countries (CEEC), a rapid increase in FDI inflows has been observed after their accession to the EU and as they have performed necessary institutional reforms. Recently, many countries have begun to pursue mega-FTAs, such as the Regional Comprehensive Economic Partnership (RCEP) and the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP), which require overall improvements in institutional quality with their high standards and high degree of openness. Traditionally, three types of FDI have been classified: (*i*) market-seeking FDI, (*ii*) resource-seeking FDI, and (*iii*) efficiency-seeking FDI. Here, an important new type of FDI, which is *good-institution-seeking* and/or *certainty-seeking*, may be added, and understanding the nexus between institutional quality and global market structure should be an urgent research priority.

This paper has developed a two-country general equilibrium trade/FDI model, which solves a complementarity problem with different firm types emerging endogenously. Traditional factor endowment trade theory is extended by incorporating multinational firms and country-specific institutional quality. Four different firm types compete in the global market and emerge endogenously. When firms choose their base country, country-specific institutional quality plays an important role. Poor institutional quality in a country increases the investment costs in that country, meaning that firms choose the other country as their base country, while better institutional quality may be an important trigger for FDI inflows. Thus, institutional quality may be a critical trigger for all the gains from globalization which have been highlighted by the literature to date.

Traditional trade theories do not consider institutional quality factors, implicitly assuming that all countries have the same institutional quality levels and that they do not influence firms' investment decisions. By incorporating multinational firms and country-specific institutional quality into the traditional factor endowment trade theory, this paper shows that even small variations in institutional quality can affect the equilibrium of the global market structure. In particular in the case of multinational firms that have to incur higher fixed setup costs than national competitors. As shown, multinational firms may change their headquarter to other countries with even a small deterioration in

institutional quality in their country. For governments aiming to attract more multinational firm activities, controlling and improving overall institutional quality can be as effective as other policies, such as tax incentives.

One of the main interests of trade economists to date has been on the links between countries' characteristics and aggregate trade/investment patterns. Traditional trade theories have highlighted, among other things, the role of productivity and endowment differences in the determination of aggregate trade/investment patterns. The present paper studies the nexus between the institutional quality and the aggregate trade/investment patterns. Needless to say, further elaboration of the simplified setup as well as consideration of other factors might lead to interesting and even different results. The model in this paper considered horizontal FDI in light of its dominance during past decades; however, vertical FDI has been growing rapidly. Though similar results might be expected as long as better institutional quality reduces firms' investment costs, extending the model to incorporate various motives and forms of FDI would be an interesting future research direction. In addition, firms' investment decisions depend on many other factors, such as the type of investment, industry, country, etc. In particular, in today's world that is driven by technological innovation and changes, providing more specifically targeted incentives for multinational firms might be as important as improving the overall institutional quality of the country to attracting more multinational firm activities. Finally, this study focused on deriving general theoretical insights on the nexus between institutional quality and international trade/investment patterns. Empirically testing the main implications in specific environments for a particular country, region, sector, etc., would be another promising direction for future research.

Funding: Part of this work was supported by the Ministry of Education of the Republic of Korea and the National Research Foundation of Korea.

Data Availability Statement: Not applicable.

Conflicts of Interest: The author declares no conflict of interest.

References

1. Worldwide Governance Indicators. Available online: https://info.worldbank.org/governance/wgi/ (accessed on 8 November 2022).
2. North, D.C. *Structure and Change in Economic History*, 1st ed.; Norton & Company: New York, NY, USA, 1982.
3. North, D.C. *Institutions, Institutional Change, and Economic Performance*, 1st ed.; Cambridge University Press: New York, NY, USA, 1990.
4. North, D.C. Institutions and the Performance of Economies Over Time. In *Handbook of New Institutional Economics*, 1st ed.; Menard, C., Shirley, M.M., Eds.; Springer: New York, NY, USA, 2005; pp. 21–30.
5. Acemoglu, D.; Johnson, S.; Robinson, J.A. The Colonial Origins of Comparative Development: An Empirical Investigation. *Am. Econ. Rev.* **2001**, *91*, 1369–1401. [CrossRef]
6. Acemoglu, D.; Johnson, S.; Robinson, J.A. Reversal of Fortune: Geography and Institutions in the Making of the Modern World Income Distribution. *Q. J. Econ.* **2002**, *117*, 1231–1294. [CrossRef]
7. Acemoglu, D.; Johnson, S.; Robinson, J.A. Institutions as a Fundamental Cause of Long-Run Growth. In *Handbook of Economic Growth*, 1st ed.; Aghion, P., Durlauf, S.N., Eds.; Elsevier: Amsterdam, The Netherlands, 2005; Volume 1A, pp. 385–472.
8. Easterly, W. *The Elusive Quest for Growth: Economists' Adventures and Misadventures in the Tropics*, 1st ed.; MIT Press: Cambridge, MA, USA, 2001.
9. Easterly, W. *The Tyranny of Experts: Economists, Dictators, and the Forgotten Rights of the Poor*, 1st ed.; Basic Books: New York, NY, USA, 2013.
10. Grossman, G.M.; Helpman, E. *Innovation and Growth in the Global Economy*, 1st ed.; MIT Press: Cambridge, MA, USA, 1991.
11. Zhu, L.; Jeon, B. International R&D Spillovers: Trade, FDI, and Information Technology as Spillover Channels. *Rev. Int. Econ.* **2007**, *15*, 955–976. [CrossRef]
12. Zhang, K.H. Does foreign direct investment promote economic growth? Evidence from East Asia and Latin America. *Contemp. Eon. Policy* **2001**, *19*, 175–185. [CrossRef]
13. Makki, S.S.; Somwaru, A. Impact of FDI and trade on economic growth: Evidence from developing countries. *Am. J. Agr. Econ.* **2004**, *86*, 795–801. [CrossRef]
14. Liu, Z. Foreign direct investment and technology spillovers: Theory and evidence. *J. Dev. Econ.* **2008**, *85*, 176–193. [CrossRef]
15. Wang, M. Manufacturing FDI and economic growth: Evidence from Asian economies. *Appl. Econ.* **2009**, *41*, 991–1002. [CrossRef]
16. Alfaro, L.; Chanda, A.; Kalemli-Ozcan, S.; Sayek, S. FDI and economic growth: The role of local financial markets. *J. Int. Econ.* **2004**, *64*, 89–112. [CrossRef]

17. Azman-Saini, W.N.W.; Law, S.H.; Ahmad, A.H. FDI and economic growth: New evidence on the role of financial markets. *Econ. Lett.* **2010**, *107*, 211–213. [CrossRef]
18. Osei, M.J.; Kim, J. Foreign direct investment and economic growth: Is more financial development better? *Econ. Model.* **2020**, *93*, 154–161. [CrossRef]
19. Wei, S.J. How Taxing is Corruption on International Investors? *Rev. Econ. Stat.* **2000**, *82*, 1–11. [CrossRef]
20. Buchanan, B.G.; Quan, V.L.; Meenakshi, R. Foreign direct investment and institutional quality: Some empirical evidence. *Int. Rev. Financ. Anal.* **2012**, *21*, 81–89. [CrossRef]
21. Bénassy-Quéré, A.; Coupet, M.; Mayer, T. Institutional Determinants of Foreign Direct Investment. *World Econ.* **2007**, *30*, 764–782. [CrossRef]
22. Aizenman, J.; Spiegel, M. Institutional efficiency and the investment share of foreign direct investment. *Rev. Int. Econ.* **2006**, *14*, 683–697. [CrossRef]
23. Knack, S.; Keefer, P. Institutions and economic performance: Cross-country tests using alternative institutional measures. *Econ. Polit. Oxford* **1995**, *7*, 207–228. [CrossRef]
24. Lee, J.Y.; Mansfield, E. Intellectual Property Protection and U.S. Foreign Direct Investment. *Rev. Econ. Stat.* **1996**, *78*, 181. [CrossRef]
25. Gani, A. Governance and foreign direct investment links: Evidence from panel data estimations. *Appl. Econ. Lett.* **2007**, *14*, 753–756. [CrossRef]
26. Daude, C.; Stein, E. The quality of institutions and foreign direct investment. *Econ. Polit. Oxford* **2007**, *19*, 317–344. [CrossRef]
27. Jensen, N.M. Democratic Governance and Multinational Corporations: Political Regimes and Inflows of Foreign Direct Investment. *Int. Organ.* **2003**, *57*, 587–616. [CrossRef]
28. Julio, B.; Yook, Y. Policy uncertainty, irreversibility, and cross-border flows of capital. *J. Int. Econ.* **2016**, *103*, 13–26. [CrossRef]
29. Alfaro, L.; Kalemli-Ozcan, S.; Volosovych, V. Why doesn't capital flow from rich to poor countries? An empirical investigation. *Rev. Econ. Stat.* **2008**, *90*, 347–368. [CrossRef]
30. Singh, H.; Jun, K. *Some New Evidence on Determinants of Foreign Direct Investment in Developing Countries*; The World Bank Policy Research Working Paper; World Bank: Washington, DC, USA, 1999. [CrossRef]
31. Desai, M.; Foley, C.; Hines, J. A multinational perspective on capital structure choice and internal capital markets. *J. Financ.* **2005**, *59*, 2451–2488. [CrossRef]
32. Desai, M.; Foley, C.; Hines, J. Capital structure with risky foreign investment. *J. Financ. Econ.* **2008**, *88*, 534–553. [CrossRef]
33. Gelos, R.; Wei, S. Transparency and international portfolio holdings. *J. Financ.* **2005**, *60*, 2987–3020. [CrossRef]
34. Papaioannou, E. What drives international financial flows? Politics, institutions and other determinants. *J. Dev. Econ.* **2009**, *88*, 269–281. [CrossRef]
35. Hermes, N.; Lensink, R. Capital flight and the uncertainty of government policies. *Econ. Lett.* **2001**, *71*, 377–381. [CrossRef]
36. Dixit, A. International trade, foreign direct investment, and security. *Annu. Rev. Econ.* **2011**, *3*, 191–213. [CrossRef]
37. Dixit, A. Entry and Exit Decisions under Uncertainty. *J. Polit. Econ.* **1989**, *97*, 620–638. [CrossRef]
38. Dixit, A. Investment and Hysteresis. *J. Econ. Perspect.* **1992**, *6*, 107–132. [CrossRef]
39. Dixit, A. Irreversible investment with uncertainty and scale economies. *J. Econ. Dyn. Control* **1995**, *19*, 327–350. [CrossRef]
40. Pindyck, R.S. Irreversible Investment, Capacity Choice, and the Value of the Firm. *Am. Econ. Rev.* **1988**, *78*, 969–985. [CrossRef]
41. Pindyck, R.S. Irreversibility, Uncertainty, and Investment. *J. Econ. Lit.* **1991**, *29*, 1110–1148. [CrossRef]
42. Dixit, A.; Pindyck, R. *Investment under Uncertainty*, 1st ed.; Princeton University Press: Princeton, NJ, USA, 1994.
43. Stokey, N. Wait-and-see: Investment options under policy uncertainty. *Rev. Econ. Dyn.* **2016**, *21*, 246–265. [CrossRef]
44. Rodrik, D. Policy uncertainty and private investment in developing countries. *J. Dev. Econ.* **1991**, *36*, 229–242. [CrossRef]
45. Bloom, N.; Bond, S.; Van Reenen, J. Uncertainty and Investment Dynamics. *Rev. Econ. Stud.* **2007**, *74*, 391–415. [CrossRef]
46. Chen, Y.-F.; Funke, M. Option Value, Policy Uncertainty, and the Foreign Direct Investment Decision. Discussion Paper Series 26373, Hamburg Institute of International Economics. 2003.
47. Pindyck, R.; Solimano, A. Economic Instability and Aggregate Investment. *NBER Macroecon. Annu.* **1993**, *8*, 391–415. [CrossRef]
48. Caballero, R. On the sign of the investment–uncertainty relationship. *Am. Econ. Rev.* **1991**, *81*, 279–288. Available online: https://www.jstor.org/stable/2006800 (accessed on 9 November 2022).
49. Bulan, L. Real Options, irreversible investment and firm uncertainty: New evidence from U.S. firms. *Rev. Financ. Econ.* **2005**, *14*, 255–279. [CrossRef]
50. Guiso, L.; Parigi, G. Investment and demand uncertainty. *Q. J. Econ.* **1999**, *114*, 185–227. [CrossRef]
51. Rajan, R.; Marwah, S. The effects of policy uncertainty on the choice and timing of foreign direct investment: An exploratory firm-level assessment. *J. Econ. Dev.* **1998**, *23*, 37–58.
52. Dixit, A.; Victor, N. *Theory of International Trade*; Cambridge University Press: Cambridge, UK, 1980.
53. Helpman, E.; Krugman, P.R. *Market Structure and Foreign Trade: Increasing Returns, Imperfect Competition, and the International Economy*; MIT Press: Cambridge, MA, USA, 1985.
54. Helpman, E. A Simple Theory of International Trade with Multinational Corporations. *J. Polit. Econ.* **1984**, *92*, 451–471. [CrossRef]
55. Hirsch, S. An International Trade and Investment Theory of the Firm. *Oxf. Econ. Pap.* **1976**, *28*, 258–270. Available online: https://www.jstor.org/stable/2662697 (accessed on 9 November 2022). [CrossRef]
56. Markusen, J.R. Multinational, Multi-Plant Economies, and the Gains from Trade. *J. Int. Econ.* **1984**, *16*, 205–226. [CrossRef]

57. Markusen, J.R.; Venables, A.J. Multinational Firms and the New Trade Theory. *J. Int. Econ.* **1998**, *46*, 183–203. [CrossRef]
58. Markusen, J. *Multinational Firms and the Theory of International Trade*, 1st ed.; MIT Press: Cambridge, MA, USA, 2002.
59. Navaretti, G.B.; Venables, A.J. *Multinational Firms in the World Economy*, 1st ed.; Princeton University Press: Princeton, NJ, USA, 2004.
60. Caves, R.E. *Multinational Enterprise and Economic Analysis*, 3rd ed.; Cambridge University Press: New York, NY, USA, 2007.
61. Jung, J. Institutional Quality, FDI, and Productivity: A Theoretical Analysis. *Sustainability* **2020**, *12*, 7057. [CrossRef]
62. GAMS. Available online: https://www.gams.com/ (accessed on 8 November 2022).
63. Roberts, M.J.; Tybout, J.R. Producer turnover and productivity growth in developing countries. *World Bank Res. Obser.* **1997**, *12*, 1–18. [CrossRef]
64. Bernard, A.B.; Jensen, J.B. Exporting and productivity in the USA. *Oxford Rev. Econ. Pol.* **2004**, *20*, 343–357. [CrossRef]
65. Aw, B.; Chung, S.; Roberts, M. Productivity and turnover in the export market: Micro-level evidence from the republic of Korea and Taiwan (China). *World Bank Econ. Rev.* **2000**, *14*, 65–90. [CrossRef]
66. Clerides, S.; Lach, S.; Tybout, J. Is learning by exporting important? Micro-dynamic evidence from Colombia, Mexico, and Morocco. *Q. J. Econ.* **1998**, *113*, 903–947. [CrossRef]
67. Girma, S.; Gorg, H.; Strobl, E. Exports, international investment, and plant performance: Evidence form a non-parametric test. *Econ. Lett.* **2004**, *83*, 317–324. [CrossRef]
68. Melitz, M.J. The impact of trade on intra-industry reallocations and aggregate industry productivity. *Econometrica* **2003**, *71*, 1695–1725. [CrossRef]
69. Helpman, E.; Melitz, M.J.; Yeaple, S.R. Export Versus FDI with Heterogeneous Firms. *Am. Econ. Rev.* **2004**, *94*, 300–316. [CrossRef]
70. Grossman, G.M.; Maggi, G. Diversity and Trade. *Am. Econ. Rev.* **2000**, *90*, 1255–1275. [CrossRef]
71. Grossman, G.M. The Distribution of Talent and the Pattern and Consequences of International Trade. *J. Polit. Econ.* **2004**, *112*, 209–239. [CrossRef]
72. Antràs, P.; Garicano, L.; Rossi-Hansberg, E. Offshoring in a Knowledge Economy. *Q. J. Econ.* **2006**, *121*, 31–77. [CrossRef]
73. Costinot, A.; Vogel, J. Matching and Inequality in the World Economy. *J. Polit. Econ.* **2010**, *118*, 747–786. [CrossRef]
74. Helpman, E.; Itskhoki, O.; Redding, S. Inequality and Unemployment in a Global Economy. *Econometrica* **2010**, *78*, 1239–1283. [CrossRef]
75. Blanchard, E.; Willmann, G. Trade, education, and the shrinking middle class. *J. Int. Econ.* **2016**, *99*, 263–278. [CrossRef]
76. Jung, J. Technology, skill, and growth in a global economy. *Econ. Theory* **2019**, *68*, 609–641. [CrossRef]
77. Jung, J. International Trade and Human Capital Investment with Heterogeneous Firms and Workers: Modeling and Analysis. *Mathematics* **2021**, *9*, 1106. [CrossRef]
78. Baldwin, R. *Globalization: The Great Unbundling(s)*; Paper for the Finnish Prime Minister's Office; Economic Council of Finland: Helsinki, Finland, 2006.
79. Harms, P.; Jung, J.; Lorz, O. Offshoring and Sequential Production Chains: A General Equilibrium Analysis. *Can. J. Econ.* **2021**, *54*, 623–647. [CrossRef]
80. Saliola, F.; Zanfei, A. Multinational firms, global value chains and the organization of knowledge transfer. *Res. Policy.* **2009**, *38*, 369–381. [CrossRef]