Protection From FDI and Economies of Scale

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Abstract

Economies of scale are a characteristic feature of modern market competition. Economies of scale that are internal to the firm lead to industrial concentration and radical changes in industries if one firm supersedes another; external economies of scale lead to geographic concentration and disruptive changes in location if one country's industrial growth surpasses that of another. I argue that these effects play a critical role in shaping attitudes toward restrictions on FDI by domestic producers. Industries with high internal economies of scale are likely to pressurize their government to impose higher restrictions on inbound FDI to avoid fierce new competition; industries with high external economies of scale are more likely to welcome FDI in order to consolidate their country as a production hub. I develop these insights in a formal model of the endogenous determination of barriers to foreign investment, and examine data on barriers to FDI across different industries in 36 OECD countries. I find evidence for both these patterns: economies of scale are a crucial industrial feature for understanding variation in barriers to FDI across both industries and countries.

Keywords: Foreign direct investment, FDI regulation, rent-seeking, economies of scale

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1 Introduction

One of the defining features of globalization in the twenty-first century is the proliferation of global production networks. From large auto manufacturing companies – such as BMW, Hyundai, and Toyota – to small high-tech companies in Silicon Valley, multinational companies have stretched their affiliates and subsidiaries worldwide. This trend is well reflected in the study of foreign direct investment (FDI). In the period from the 1990s to the early 2000s, much of the literature on the politics of FDI in the field of international political economy focused on how host governments competitively attract inbound FDI (Li and Resnick, 2003; Büthe and Milner, 2008, 2009; Kerner, 2009). In addition, scholars have also paid a great deal of attention to understanding FDI flows from the investors' perspective and identifying which political factors are most important as the determinants of FDI (Henisz, 2000; Jensen, 2003, 2008; Li and Vashchilko, 2010; Wright and Zhu, 2018). These studies tend to focus on the positive effect of FDI on the economy of the host country.

However, the FDI openness of each country does not necessarily reflect the positive views on inbound FDI. In fact, numerous countries impose restrictions on FDI inflow through domestic policies that increase the production/operational costs of foreign firms (i.e., higher tax on foreign asset transactions or employment conditions). According to the 2018 World Investment Report by UNCTAD, a significant number of countries have adopted formal industrial development policies that are specifically designed to either regulate or deregulate FDI in each segment of an industry. Figure 2.1 depicts the average FDI restrictiveness levels across industries of 36 members of the Organization for Economic Co-operation and Development (OECD) and 32 non-OECD countries.[1] Why do we see this variation across countries? More importantly, who wants more FDI regulations and whose interests matter more to the government when shaping FDI policies? Several studies have pointed out the preferences of voters, workers, and labor unions causing high or low FDI restrictiveness in different industries and sectors (Malesky and Mosley, 2018; Owen, 2013, 2015; Pandya, 2010, 2014).

In this paper, I address these questions by examining the effects of FDI on domestic industrial equilibrium. Economies of scale that are internal and external to firms play a critical role in shaping the preferences of domestic producers over inward FDI regulation.[2] First, I argue that industries with internal economies of scale (IEoS) are more likely to have higher FDI restrictions. Under the existence of IEoS, industries tend to be structured as oligopolies, where only a few large companies compete with each other. Hence, even

[1] Restrictions on FDI is not only striking across countries, but across industries within each country. See the Appendix for graphical depiction.

[2] In this paper, I use "domestic firms" and "domestic producers" interchangeably.

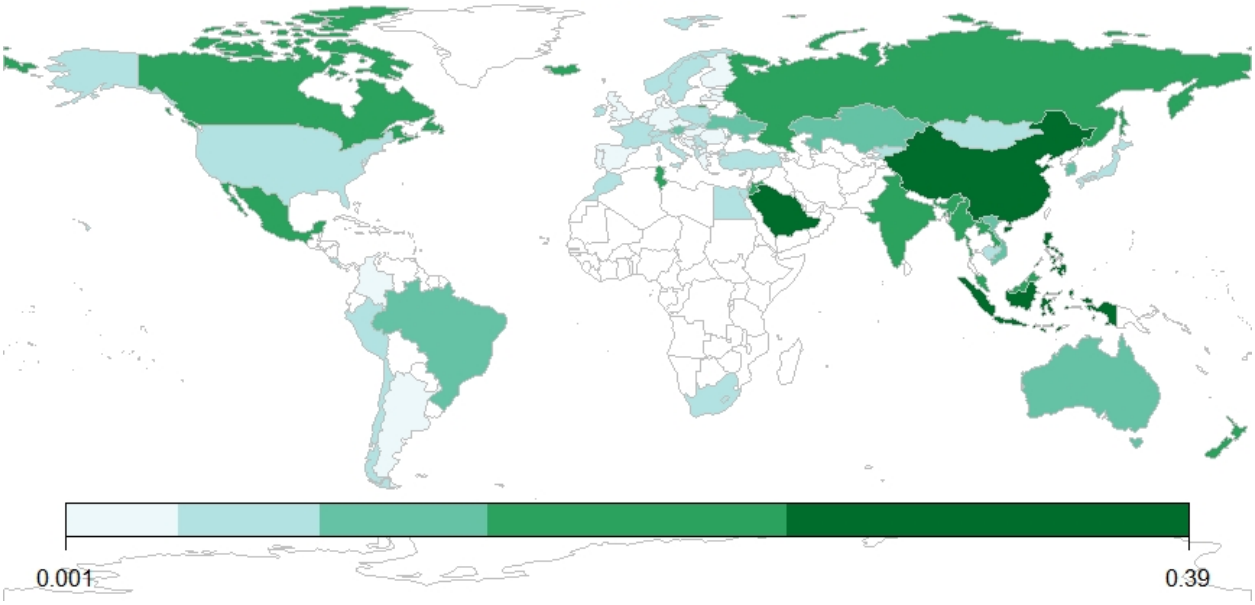


Figure 1: Average FDI Restrictiveness Index (2017)

one additional firm entrant can have a highly disruptive effect on the market, which leads to changes in political equilibrium. Moreover, foreign MNCs investing in an oligopolistic industry are often direct global rivals of domestic MNCs. This implies that they are more efficient or at least as efficient in producing high-quality goods and services. Thus, domestic firms in IEoS industries will pressure their government to impose higher FDI restrictions on inbound FDI in order to avoid heightened market competition.

Second, in contrast to IEoS industries, I argue that industries with external economies of scale (EEoS) are more likely to have lower FDI restrictiveness. EEoS industries tend to exhibit perfect or monopolistic competition, typically characterized with a large number of small- and medium-sized firms. Thus, these domestic firms are less sensitive to supply shocks brought by foreign newcomers. In fact, domestic firms may actually support inward FDI because external economies of scale contribute to the productivity of a firm through technology advancements and information spillovers at the industry-level. Moreover, these spillover effects often occur with the geographic agglomeration of firms. With more inward FDI, domestic producers can consolidate their region as a production hub. Therefore, firms in industries with high external economies of scale are more likely to welcome FDI to consolidate their country as a production hub.

In order to explore the effects of economies of scale on the industrial equilibrium, I develop a formal model using Cournot triopoly and the political support function approach given by Grossman and Helpman (1994). Two domestic firms and a newly entered foreign firm compete in a Cournot fashion, thereby setting the amount of output that maximizes

their profit. Domestic producers offer political contributions to their home government for protection. Governments trade-off producer profits against lower prices for consumers when determining the level of restrictions on FDI. The optimal level of FDI restriction is set endogenously, depending on the market competition and government's weight on consumer utility (average welfare). Numeric simulations indicate that the increase in each firm's ability to reduce costs through firm-level growth (internal economies of scale) increases FDI restrictions, while an increase in each firm's ability to reduce costs through industry-level growth (external economies of scale) decreases FDI restrictions.

In order to test this model, I examine data on inbound FDI restrictiveness across different industries in OECD member countries. I find evidence that industries with high IEoS, measured by different proxies – such as market concentration and amount of fixed assets – are associated with higher FDI restrictiveness. I also find that industries with high EEoS – measured by proxies such as geographic concentration of firms, research and development (R&D) expenditures, and amount of intangible assets – associated with lower FDI restrictiveness. In addition to the main dataset using the FDI restrictiveness index, I adopted three alternative measures for FDI restrictiveness. All three measures – total number of bilateral investment treaties (BITs), World Bank ease of doing business scores, and Shatz (2000) FDI openness scores – support my hypotheses in general. These results suggest that economies of scale are a crucial industrial feature for understanding variation in barriers to FDI across both industries and countries.

This paper makes three contributions to the research on politics of FDI. First, I address the question: why do FDI regulation vary dramatically across industries? I develop a new rigorous theory by emphasizing the importance of domestic producers and industrial features, areas that have gained less attention from the existing international political economy scholarship. By bringing insights from business and economics literature, I bridge the gap between different disciplines on the topic of FDI and multinationals. Second, through both formal and empirical models, I show that industrial structures shaped by two types of economies of scale are crucial for understanding the variation in barriers to FDI across both industries and countries. Finally, this paper sheds light on protectionism as a reaction to globalization occurring in domains other than trade or off-shoring. By focusing on developed countries, I point out that even in the most globalized countries, domestic producers demand industrial protection from their governments to maintain a better position compared to their global rivals. Therefore, protection from inward FDI will continue to remain in industries where domestic firms have much influence over politics.

2 Domestic Preferences and FDI Regulations

The literature on domestic FDI policies includes restrictions on the market entry and operations of MNCs, as well as FDI promotion efforts by offering MNCs tax incentives and subsidized production inputs (Pandya, 2016). Literature on FDI promotion has emphasized how MNCs or host countries overcome the political risk of FDI. From the perspective of MNCs, different types of entry modes can help MNCs to avoid exploitation from the host government (Henisz, 2000; Johns and Wellhausen, 2016). From the host government's perspective, democratic institutions or international treaties, like bilateral investment treaties (BITs), can function as a credible commitment for FDI protection (Jensen, 2008; Jensen et al., 2012; Büthe and Milner, 2008; Kerner, 2009).

Extant scholarship has focused on the role that consumers and workers play in shaping FDI regulation. A few studies have examined how voters' preferences over inward FDI are shaped by characteristics of the investment — size, number of jobs, potential environmental damage, and labor commitments (Pandya, 2010, 2014; Malesky and Mosley, 2018). Moreover, the preferences of labor or the political organization of labor unions may also shape FDI restrictions (Owen, 2013, 2015). Several studies have also examined the role of political parties and domestic institutions in mediating the influence of these actors (Pinto and Pinto, 2008; Pinto, 2013; Li and Resnick, 2003). In comparison, there is comparatively less work on the attitudes and preferences of domestic firms that face the clearest and most direct impacts from FDI due to market competition.

Studies in business and economics have emphasized the importance of industrial structure and market competition in FDI strategies developed by multinationals (Hymer, 1976; Knickerbocker, 1973; Chwo-Ming and Ito, 1988; Ghemawat and Thomas, 2008). Scholars have also ascertained that MNCs strategically locate their foreign affiliates – either locating closer to or further from each other – to increase profit. These studies suggest that some firms benefit by geographic proximity, which increases information and knowledge spillovers, while others benefit by distancing from other MNCs to focus on their own firm-specific skills and worry less about competing for available workers (Head et al., 1994; Hanson, 2001; Alcácer and Chung, 2014; Cantwell, 2009). However, these studies focus more on the strategies of multinationals rather than how domestic multinationals would react to the entry of their global rivals.

In this paper, I expand the market effect aspect of existing literature and argue that while it may appear that domestic businesses uniformly dislike competition with foreign MNCs, some domestic producers may actually be favorable to FDI depending on their industry characteristics. I focus on two key economic mechanisms − internal and external economies

of scale − and domestic firms' political interaction with the home government. This paper contributes to the existing literature in two parts: first, the paper explores the FDI policy preferences of domestic firms, which have been relatively understudied in the field of international political economy; and second, the paper emphasizes the differences in this regard not only across countries but across industries within each country.

3 Theoretical Framework: Economies of Scale

3.1 Economies of Scale and FDI Regulation

What shapes the preferences of domestic producers regarding inward FDI? In this paper, I use Marshall's categorization of economies of scale as the key analytical mechanism to explain the disruptive effects of inbound FDI on domestic industrial equilibrium and how the changes in the equilibrium influences producers' FDI policy preferences.[3] Internal economies of scale (IEoS) occur when a firm's cost of producing an additional unit of a good decreases as the size of the firm grows. For example, a large manufacturing company that produces automobiles would benefit from producing as many cars as possible rather than producing a small quantity. Because IEoS occurs within an individual firm at the industry level, the firm-specific skills that contribute to IEoS lead to an increase in competition at an industry-level. In contrast, external economies of scale (EEoS) occur outside an individual firm but within an industry. When a firm is experiencing EEoS, it implies that the firm can reduce the cost of producing products when the entire industry grows. EEoS often occur with geographic agglomeration, which allows reduction in transportation costs and facilitates information exchanges. Examples of EEoS include investment banking in New York, entertainment industry in Hollywood, and the information technology industry in the bay area. In the following subsections, I explain how the market equilibrium of domestic industries with IEoS and EEoS are disrupted by FDI and how the changes shape domestic firms' FDI policy preferences.

[3] "The distinction between internal and external economies was introduced by Marshall (1890), and it is often referred to as the Marshall-Arrow-Romer (MAR) externalities in reference to contributions of Marshall (2009), Arrow (1971) and Romer (1990). Much of work on external economies focuses on economies external to the firm but internal to the industry, [but there are also] work that considers cross-industry externalities" (Caballero and Lyons, 1990). "[External] scale economies may arise from information spillovers, search, and matching processes in labor markets, local intra-industry specialization, and the like." (Henderson, 2003). In short, external economies of scale could be understood as positive externalities. As the size of an industry grows, all the firms within that industry all experience increasing returns to scale in the long-run.

3.2 Industries with Internal Economies of Scale Oppose FDI

Industries characterized by IEoS often have an oligopolistic market structure, where only a few large firms dominate a large portion of market share. In such an environment, even one additional supplier leads to significantly higher market competition and reduced prices and profits. To achieve IEoS, a firm spends a huge amount of fixed cost at the initial stage of production, because the more it produces, the lower the cost of producing each additional unit of goods; thus, this enables the firm to ultimately earn higher profit. Because a firm has to pay a large lump sum cost initially, there exists a high entry barrier in industries where firms experience IEoS. This leads to only a small number of large companies dominating the market share in an IEoS industry. Thus, when a rival foreign MNC, which can afford the high upfront cost, enters such an oligopolistic market, incumbent firms would have to pay the cost of adjusting their business strategies. Studies also show that an increase in production by foreign MNCs leads to a decrease in output price (in the short run), thereby reducing domestic firms' profitability and, thus, causing negative impact on their survival (Chwo-Ming and Ito, 1988; Chari and Gupta, 2008; Görg and Strobl, 2003). Therefore, domestic firms in IEoS industries are likely to be against foreign rival MNCs entering the market.

Second, industries with IEoS have multiple market equilibria, which makes a new entrance highly destabilizing. Once firms enter the IEoS market, they produce goods in large quantities to achieve scale economies, which optimizes their profits. This increases the total supply of goods in the market and disrupts the market equilibrium through changes in the price. Moreover, in many cases, these foreign competitors are more productive than the incumbent domestic producers. MNCs tend to come from developed countries where technologies are highly advanced. They also have more resources, both mangerial and production skills, and capital (Pandya, 2010). This enables foreign firms to produce high-quality goods that are cheaper for consumers. Thus, the entrance of a foreign firm can be incredibly destabilizing for current market allocation, because consumers will substitute a particular product for its cheaper version. This process accelerates as domestic incumbents may lose sales and become less efficient. Consequently, they would have to raise prices, and lose even more customers. Thus, in order to secure their influence over the market, domestic firms in high IEoS industries will fight hard against foreign competition.

Finally, in IEoS markets, firms are exceptionally concerned about preserving their firm-specific cost-saving technologies. Thus, foreign firms work hard to limit technological spillovers and domestic incumbents will gain little from foreign firms investing domestically. While research on FDI spillover effects have shown some evidence that FDIs from developed economies to developing countries often bring about an increase in productivity and tech-

nology advancement, this is not applicable if the foreign firms are operating in the same industry as the domestic rivals. In such cases, foreign MNCs would attempt to protect the valuable technology against leakage to competitors (Marcin, 2008). This is because the technologies of large firms contribute to scale economies that are internal to each firm. In fact, in a firm-level study, Javorcik and Spatareanu (2005) find that spillover effects are only present when domestic and foreign firms have joint venture projects and not when foreign firms enter via greenfield investments (as wholly owned subsidiaries). Moreover, in ascertaining whether foreign MNCs have positive or negative effects on domestic firms, Aitken and Harrison (1999) find that positive technology spillover only occurs in smaller firms — those that have less than 50 employees. For large firms, they find that the spillover effects disappear and the productivity of domestic firms also declines. Therefore, I expect domestic firms in industries with high IEoS to be against foreign MNCs entering the market.

3.3 Industries with External Economies of Scale Support FDI

Industries where firms experience EEoS tend to exhibit more competitively structured markets with numerous small- and medium-sized firms. Thus, a few additional suppliers, including foreign MNCs, entering local markets do not significantly disrupt the existing industrial equilibrium. Studies on FDI behaviors have shown that firms in oligopolistic industries are more likely to engage in FDI if their global rival companies set up plants abroad. In contrast, firms in industries that feature a more competitively structured market, are not affected by their competitors' FDI behavior (Chwo-Ming and Ito, 1988; Ito and Rose, 2002). While this study does not directly discuss the protectionist behavior of domestic firms, it clearly shows that firms react differently depending on the industrial features they operate in. The more competitively structured the market, the less the incumbent domestic firms would react against foreign entry.

Second, domestic firms in such industries are likely to welcome foreign MNCs entering the market because growth in the industry will consolidate their country as a production hub. In EEoS industries, domestic firms become favorable to foreign companies entering the market, because they expect decreases in production costs as a result of the growth in the entire industry. Because EEoS typically occurs where firms in a certain industry are geographically clustered together, incumbent firms will likely benefit from more successful firms entering the market, which leads to specialization of labor, increases in the pool of skilled labor, and more government spending on regional infrastructure. Studies have shown that agglomeration of business is linked positively with labor productivity, education, and urban growth (Rauch, 1993; Ciccone and Hall, 1993; Hanson, 2001). Thus, in industries

where firms experience EEoS, domestic producers will be less sensitive to foreign MNCs entering the market.

Finally, domestic firms in EEoS industries expect productivity spillovers from foreign MNCs. Unlike firms in IEoS industries, where firm-specific skills are kept as secrets within each individual firm as secrets, firms in EEoS industries benefit from positive externalities, such as information and technology spillovers, managerial skills, and greater product specialization. The positive spillover effects also occur more frequently in EEoS industries because M&As are active in these industries, where numerous small and medium-sized local firms could be potential M&A targets for MNCs. MNCs with advanced skills can readily enter another country's market by purchasing majority shares of these domestic targets at affordable costs (Larimo, 2003; Zejan, 1990). Studies even show that spillover effects are only present when domestic and foreign firms have more direct interaction either through M&As or joint venture projects, not when foreign firms enter as wholly owned subsidiaries (Javorcik and Spatareanu, 2005). Therefore, domestic firms that are potential cross-border M&A targets welcome foreign FDI because they bring valuable capital as well as information spillovers.

3.4 Domestic Firms' Preferences and Government Policy Creation

It is natural for the host government to maximize the benefits generated from foreign capital inflow and respond to domestic firms' political pressures by setting the optimal level of FDI regulation. The host government encourages more foreign capital in the country if it expects FDI to increase the aggregate welfare of the domestic economy. Inward FDI enhances productivity of domestic incumbent firms through competition and technology transfers, prevents domestic firms that lack capital from going out of business, creates job opportunities, and helps to increase wages. This increases the gross welfare of the country, benefiting both consumers (through lower prices, more market competition) and workers (through more jobs). However, the effects of FDI may not always be positive, since foreign MNCs, on average, are larger and better equipped with higher technology compared to average domestic competitors, thereby threatening domestic firms' survival.[4] It is possible that domestic firms would utilize their political influence for protectionist policies.

Further, the political influence is much more prominent in IEoS industries than EEoS industries. In IEoS industries, there are a small number of large firms, so they can better organize for collective action. These oligopolistic industries have more political and economic resources to influence the government for protection. The host government is mindful of the political contributions of the special interest groups, which leads to higher barriers to FDI.

[4]In fact, the productivity differential between foreign and domestic firms are higher in developing than in industrialized countries (Arnold and Javorcik, 2009; Harris and Robinson, 2003; Girma and Görg, 2007).

Therefore, higher FDI restrictions are more likely in IEoS industries. In contrast, firms in EEoS industries are less organized due to lack of motivation and higher firm heterogeneity. Since the government is not pressured by the producers in EEoS industries and FDI benefits both consumers and producers, there will be lower FDI restrictions in these industries.

Figure 2.2 depicts actual US industries plotted based on whether they are more IEoS or EEoS industries. As the IEoS increase, higher FDI restrictiveness is expected, and as EEoS increase, lower FDI restrictiveness is expected. Moreover, as evident from the figure, IEoS and EEoS industries have contrasting features, which lead to high IEoS being correlated with low EEoS and high EEoS being correlated with low IEoS. Examples of IEoS industries include transportation and telecommunication, and examples of EEoS industries include wholesale, retail, and hotels and restaurants. I focus on the net effect of IEoS and EEoS. For example, even if some industries may exhibit both IEoS and EEoS characteristics, if the the net economies of scale indicates IEoS, then that industry is an IEoS industry, even though the degree of IEoS may be lower than other IEoS industries. Based on such an additive feature of the effect of economies of scale, I examine whether an industry's FDI restrictiveness is associated with either high IEoS or high EEoS. In the following section, I present a differentiated goods Cournot competition model to show the effects of IEoS and EEoS on domestic market equilibrium and how these lead to higher or lower FDI restrictiveness policies.

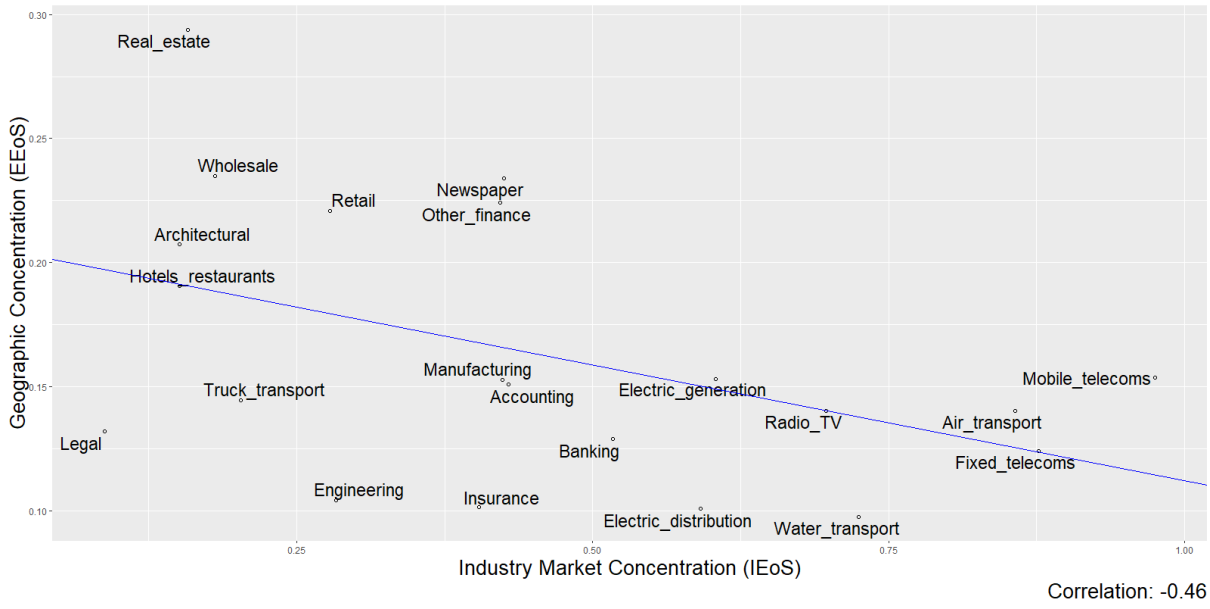


Figure 2: IEoS Industry vs. EEoS Industry

4 Formal Model

In this section, I introduce the Cournot triopoly with differentiated products to formally show how industry characteristics – internal and external economies of scale – affect domestic firms' reaction to the FDI regulation policy. For firms that compete in the IEoS industry, I add a term (θ) in the cost function to reflect a decrease in marginal costs as the size of each firm's output increases. For firms competing under an EEoS industry, I change the cost function by adding a term (η) that decreases the marginal cost as the size of all three firms' output increase. After solving for the equilibrium profits for each model, I employ the political support approach to identify the optimal level of FDI regulation set by the host government (Grossman and Helpman, 1994; Hillman, 1982). Comparative statics show that FDI restrictions increase with the degree of IEoS and decrease with the degree of EEoS.

4.1 Differentiated Cournot Triopoly Under IEoS

The market considered in this paper consists of three competing firms that interact with one another in Cournot fashion. There are two identical domestic firms ($d1, d2$) and one foreign firm (f) in a certain industry. While all firms have the same marginal cost of production (c), the foreign firm's marginal cost of production is increased by the host (domestic) government's FDI regulation policy ($\tau > 1$). Each firm produces differentiated goods, which is reflected in the following quadratic market utility function[5] of a representative consumer:

$$U(q) = \alpha(q_{d1} + q_{d2} + q_f) - \frac{1}{2}\beta(q_{d1}^2 + q_{d2}^2 + q_f^2) + \frac{1}{2}\gamma(q_{d1}q_{d2} + q_{d1}q_f + q_{d2}q_f), \tag{1}$$

where $\alpha, \beta > 0$ and $\beta > \gamma > 0$.[6] Then, the consumer maximizes the following utility function:

$$\max_q \; U(q) - \Sigma_{i\in(d1,d2,f)}^{N} p_i q_i \tag{2}$$

from which we can derive the following inverse demand functions for the firms($i \in (d1, d2, f)$):

$$p_i(q) = \frac{\partial U}{\partial q_i} = \alpha - \beta q_i - \gamma \Sigma_{j\neq i} q_j \tag{3}$$

[5]To reflect product differentiation, I use a quadratic utility (linear demand) function instead of a more popularly used constant elasticity of substitution or Cobb-Douglas function to reach an explicit equilibrium. For the linear demand function that incorporates product differentiation, see Ledvina and Sircar (2011).

[6]In this paper, I assume $\beta > \gamma > 0$, which implies that i and j are differentiated goods. Other cases include i and j as: independent goods $\gamma = 0$, homogeneous goods ($\gamma = \beta$), complementary goods ($\gamma < 0$), and substitute goods ($\gamma > 0$).

Then, the profit function for domestic firms $d1$ and $d2$ are:

$$\pi_{d1,2} = (\alpha - \beta q_{d1,2} - \gamma(q_{d2,1} + q_f))q_{d1,2} - \left(c - \frac{1}{2}\theta q_{d1,2}\right) q_{d1,2} \tag{4}$$

Here, c is the marginal cost and θ is the degree of IEoS that influences c. If $\theta > 0$, there exist IEoS in this industry, and if $\theta < 0$, there are internal diseconomies of scale. $\frac{1}{2}$ is added before θ to simplify calculations. The profit function for the foreign firm (equation (5)) is similar to that of the domestic firms, but the marginal cost is increased by τ, which is the FDI regulations imposed by the government.[7]

$$\pi_f = (\alpha - \beta q_f - \gamma(q_{d1} + q_{d2}))q_f - \left(\tau c - \frac{1}{2}\theta q_f\right) q_f \tag{5}$$

Finding out the equilibrium output and profit for each firm is rather simple, but due to mathematical complexity, I solve the Cournot triopoly numerically (in Appendix **??**).

4.2 Differentiated Cournot Triopoly Under EEoS

In this section, I add another term η that represents the degree of EEoS in the cost function and see how it changes the FDI regulation term, τ. The model set up is exactly the same as that in the IEoS industry, where two domestic firms and one foreign firm compete in the market by setting the optimal output. The following expressions are the profit functions for domestic and foreign firms under an EEoS industry:

$$\begin{aligned} \pi_{d1,2} &= p_{d1,2}q_{d1,2} - \left(c - \frac{1}{2}\theta q_{d1,2} - \eta(q_{d2,1} + q_f)\right) q_{d1,2} \\ &= \Big(\alpha - \beta q_{d1,2} - \gamma(q_{d2,1} + q_f)\Big)q_{d1,2} - \left(c - \frac{1}{2}\theta q_{d1,2} - \eta(q_{d2,1} + q_f)\right) q_{d1,2} \end{aligned} \tag{6}$$

$$\begin{aligned} \pi_f &= p_f q_f - \left(\tau c - \frac{1}{2}\theta q_f - \eta(q_{d1} + q_{d2})\right) q_f \\ &= \Big(\alpha - \beta q_f - \gamma(q_{d2} + q_f)\Big)q_f - \left(\tau c - \frac{1}{2}\theta q_f - \eta(q_{d1} + q_{d2})\right) q_f \end{aligned} \tag{7}$$

In the marginal cost functions, $c - \frac{1}{2}\theta q_{d1} - \eta(q_{d1} + q_f)$ and $\tau c - \frac{1}{2}\theta q_f - \eta(q_{d1} + q_{d2})$, the degree of EEoS, η, is dependent on the output of the industry − which is represented by

[7]FDI regulations include all types of policies − such as direct taxation on foreign assets, foreign equity limitations, ownership restrictions, or governmental approval process − that could increase the costs of producing goods when operating in a foreign country.

another domestic firm and a foreign firm. Thus, marginal cost c is reduced by the amount of η proportion of the industry output. When $\eta > 0$, the industry is experiencing EEoS, whereas if $\eta < 0$, the industry is experiencing external diseconomies of scale. Note that η term in the marginal cost function does not include the firm's own output because the effect of its own growth in output is already reflected in the θ term. I solve the model numerically due to mathematical complexity (see Appendix **??**).

4.3 Optimal FDI Regulation

The host government sets the FDI regulation policy by maximizing the social welfare of domestic actors.[8] I assume that the host government includes only the profits of domestic firms in their objective functions.[9] There are two reasons for this assumption. First, domestic firms have more means to influence domestic politicians and have plenty of information on how domestic politics work as compared to foreign firms. Second, politicians are more likely to support 'national champion' firms to promote national prestige or reputation in the global stage. Therefore, I set the host government's objective function, G, to be a combination of the representative consumer's utility and domestic firms' profits. $0 < w < 1$ is the weight that government attaches to the gross welfare of domestic economy (consumer utility) relative to the political influence of domestic firms.

$$G = \ wU^* + (1-w)(\pi^*_{d1} + \pi^*_{d2}) \tag{8}$$

In this manner, the host government cares about the foreign producer's welfare indirectly through domestic consumer's utility, and domestic producers directly influence the government based on their profit. The higher the profit, the stronger their political influence on FDI policies. To set the optimal FDI regulation policy, the host government maximizes its objective function in terms of τ:

$$\tau^* = \underset{\tau}{\operatorname{argmax}}\, G \tag{9}$$

In the following section, I use numerical simulations to solve for optimal FDI restrictions τ^* and comparative statics.

[8] I use political support function approach developed in Grossman and Helpman (1994) and Hillman (1982).
[9] Assuming that governments also include the profits of foreign firms in their objective function might make an interesting extension, which I leave to future work.

4.4 Numerical Simulations and Comparative Statics

To examine the comparative statics results of the models, I ran four sets of numerical simulations by assigning a range of numbers to each parameter (α, β, γ, c, w, θ, and η). I use computational results – instead of analytic – to show the robustness of my theory under different sets of parameters. In addition to robustness check, numerical simulations show how changes in the range of w cause changes in the effects of θ and η on τ. In both IEoS and EEoS simulations, comparative statics show expected results only when the host government gives more importance to the interests of domestic producers (in other words, $w < 0.5$).

Across 92% of the grid points in the IEoS model simulation ($S = 312,500$), I find that changes in θ is associated with positive change in τ ($\delta\tau^*/\delta\theta$), when $0.1 \leq w \leq 0.5$. However, when $0.5 \leq w \leq 0.9$, the positive relationship between θ and τ decreases to 30.4%. Table 2.1 presents the range of each parameter value for the numerical simulation of IEoS in a Cournot triopoly. Thus, the numerical simulations suggest that a host government favorable to special interest groups is more likely to impose higher FDI restrictions when domestic firms experience a higher degree of internal economies of scale. In contrast, when the host government cares more about consumers utility, there are more cases of negative association between θ and τ (69.6%) than cases of positive association. When parameters for the inverse demand function are each set to a single value ($\alpha = 1$, $\beta = 0.5$, and $\gamma = 0.2$), $\delta\tau^*/\delta\theta$ is always greater than 0 (across 100% of the grid points, $S = 10,000$), when $w < 0.5$. Thus, when the host government favors domestic producers over consumers ($w < 0.5$), greater internal economies of scale among firms in an industry (θ) will lead to higher equilibrium barriers to foreign investment (τ).

Table 1: Numerical Simulations for the IEoS Model

	Parameter	Range	Grid Points	Comparative Statics
Changing α, β, and γ	α	[1, 1.5]	5	$\delta\tau^*/\delta\theta > 0$: 92%, when $w < 0.5$
	β	[0.5, 1]	5	
	γ	[0.1, 0.4]	5	
	c	[0.5 1]	5	
	w	[0.1, 0.5] and [0.5, 0.9]	5	
	θ	[0.1, 3]	100	
Fixed α, β, and γ	α	1	1	$\delta\tau^*/\delta\theta > 0$: 100%, when $w < 0.5$
	β	0.5	1	
	γ	0.2	1	
	c	[0.5 1]	10	
	w	[0.1, 0.5] and [0.5, 0.9]	10	
	θ	[0.1, 3]	100	

In the numerical simulations for the EEoS model, I find that across 97.5% of grid points

($S = 72,900$) the relationship between external economies of scale (EEoS, η) and FDI regulations(τ) is negative when $w < 0.5$. However, when $w > 0.5$, an increase in η decreases τ only half of the time (50%). Table 2.2 presents the ranges of parameter values that were run in the simulation. η is set to be higher than 0.5 so that the effect is not shadowed by θ, which is less than or equal to 0.5. When parameters for the inverse demand curve are fixed to a certain value ($\alpha = 1$, $\beta = 0.5$, and $\gamma = 0.2$), change in η is always associated with negative change in τ (across 100% of the grid points, $S = 100,000$). Therefore, restrictiveness of FDI regulations decrease as domestic firms experience more external economies of scale within an industry. The simulations demonstrate that when the host government favors domestic producers over consumers ($w < 0.5$), greater external economies of scale among firms in an industry (η) will lead to lower equilibrium barriers to foreign investment (τ).

Table 2: Numerical Simulation Settings for the EEoS Model

	Parameter	Range	Grid Points	Comparative Statics
Changing α, β, and γ	α	[1, 1.5]	3	$\delta\tau^*/\delta\eta < 0$: 97.5%, when $w < 0.5$
	β	[0.5, 1]	3	
	γ	[0.1, 0.4]	3	
	c	[0.5 1]	3	
	w	[0.1, 0.5]	3	
	θ	[0, 0.5]	3	
	η	[0.5, 3]	100	
Fixed α, β, and γ	α	1	1	$\delta\tau^*/\delta\eta < 0$: 100%, when $w < 0.5$
	β	0.5	1	
	γ	0.2	1	
	c	[0.5 1]	10	
	w	[0.1, 0.5]	10	
	θ	[0, 0.5]	10	
	η	[0.5, 3]	100	

5 Empirical Analysis

5.1 Arguments and Hypotheses

First, industries with high internal economies of scale tend to have high market concentration, or an oligopolistic structure. The domestic producers of IEoS industries will be wary of inward FDI because the disruption in the market equilibrium has negative consequences. An additional foreign competitor in the market will increase the supply of goods and services, which leads to a decrease in the prices. Moreover, in IEoS industries, foreign MNCs are at

least as efficient and productive as domestic MNCs. Thus, incumbent domestic producers will be against foreign MNCs entering their market and pressure their government for more restrictive inward FDI policies. Therefore, industries with high economies of scale will have higher FDI restrictiveness.

> *Hypothesis 1: Industries with greater internal economies of scale among firms are likely to have more restrictions on inbound FDI.*

Second, industries with high external economies of scale typically exhibit features that are closer to perfect competition, where the entry of newcomers does not have as much of a negative affect as it does in IEoS industries. Firms in EEoS tend to concentrate geographically in order to benefit from information exchanges, technology spillovers, and specialization. Thus, incumbent firms may actually benefit from foreign MNCs entering the market. Therefore, industries with high external economies of scale will have lower FDI restrictiveness.

> *Hypothesis 2: Industries with greater external economies of scale among firms are likely to have less restrictions on inbound FDI.*

5.2 Data and Measurements

Dependent Variable: OECD FDI Restrictiveness Index

To test the hypotheses above, I created a dataset of 30 industries for each 36 OECD member countries. The dependent variable, FDI restrictiveness index (hereafter, FDI index), measures the inward FDI restrictiveness of 43 industries/sectors of the 59 OECD and non-OECD countries in 1997, 2003, 2006, and from 2010 to 2018. The 43 categories include the sub-categories of industries, and after excluding the higher categories, there are 30 separate industries in the data. The index ranges from 0 to 1, with 1 being 100% restrictive. The FDI index is based on the "OECD Code of Liberalisation of Capital Movements" and the "OECD National Treatment Instrument." Each country has explicitly lodged reservations for different types of FDI on various industries.[10] Figure 2.3 below depicts the average FDI Restrictiveness Index of OECD countries by industry. As evident from the figure, even within relatively advanced economies (OECD), FDI regulations exist across all industries.

Independent Variables: Proxies for IEoS and EEoS

[10]The reservations present which industries countries would like to be exempt from liberalization of capital. For example, in the final section of the Code, Australia lodged reservation on a foreign entity's real estate purchase. In other words, Australia reserves its right to impose restrictions on real estate purchase from a foreign entity. OECD data on the FDI Restrictiveness Index takes these reservations into account, when measuring FDI restrictiveness.

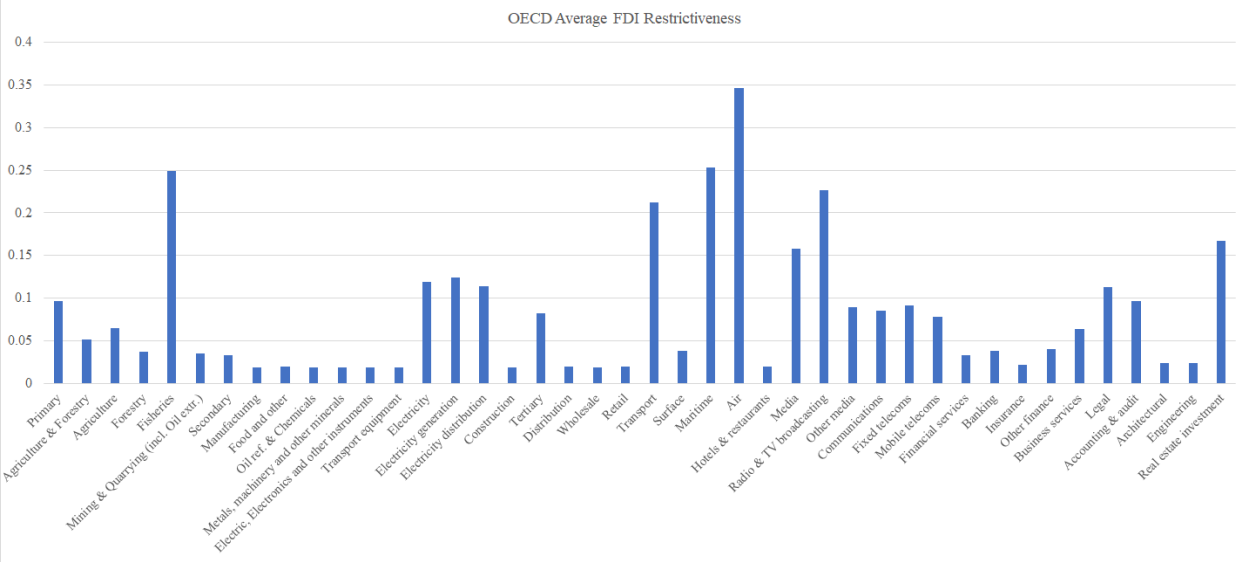


Figure 3: OECD Average FDI Restrictiveness Index by Industry (2017)

I employ several different proxy measures to determine the extent to which industries are characterized by internal or external economies of scale. I first use data collected from the U.S. Census Bureau to examine the relationship between two different industry characteristics and FDI restrictiveness. Here, I treat industries as if they exhibit similar features across countries. Using U.S. industry-level data, I test my hypothesis on 36 OECD countries. In the second dataset, I use industry-level data of Structural and Demographic Business Statistics (SDBS) from the OECD statistics database. Finally, I also collect firm-level accounting data from the Orbis database.

U.S. Census Bureau Data

In the first dataset, I utilize data on the the market concentration and the number of enterprise from the U.S. Census Bureau database as a baseline model to test my hypotheses. [11] I use the U.S. industry data because the data includes a detailed categorization of industries (21 in total), which matches well with the industry categorization of the dependent variable (FDI restrictiveness index). Currently, the available years for market concentration and number of enterprises are 2002, 2007, and 2012. Since the FDI restrictiveness index years begin from 2010, I utilize data for only 2012.[12] Market concentration – measured by the market share of the top 4, 8, 20, and 50 companies – is used as a proxy for internal economies of scale. Further, I utilize the market share of the the top 20 companies because it is closest to the average of all four measures.

[11] American FactFinder, U.S. Census Bureau (accessed 04.17.2019.)

[12] While FDI restrictiveness index does include data for 1997, 2003, and 2006, OECD has changed its method of measuring the restrictiveness since 2010. Thus, for consistency, I only utilize the years from 2010 onward.

For external economies of scale, I measure industry geographic concentration as a proxy for external economies of scale. This is an appropriate proxy because EEoS often occurs when firms have information and technological spillover effects, which is most likely to happen when firms are located close to each other geographically. Just like industry concentration data, the OECD data to measure EEoS contains a lot of missing values and broad industry categories; thus, I utilize U.S. data to test the hypotheses. For the U.S. baseline data, I use the data on the number of enterprise establishments by major regions within the U.S. that is collected from the same database as that for the U.S. industry concentration. To calculate the geographic concentration by industry, I take the ratio of the maximum number of enterprise establishments in a region to the entire number of enterprise establishments in the U.S. Similar to the market concentration data in the U.S., there are 21 industries in this dataset.

$$\text{Geographic Concentration} = \frac{\text{Highest number of firms among all regions}}{\text{Entire number of firms in the U.S.}}$$

OECD SDBS Data

In the second dataset, I utilize industry-level enterprise birth rate and R&D expenses data from the OECD statistics database. Despite disagreements regarding how to define barriers to entry(Demsetz, 1982), most economists agree that these barriers are often some sort of fixed entry cost.[13] Hennart and Park (1993) and Slangen and Hennart (2007) suggest that firms, unless they expect high profit in the long-run through economies of scale, will not enter foreign markets via greenfield investment. Thus, while it is controversial to say that barriers to entry are equivalent to economies of scale, it is safe to assume that firms would want to set long-run prices above long-run average cost in order to compensate for the high fixed costed paid during market entrance (Pandya, 2014). If this is the case, there must be low amounts of new entry in industries with high IEoS. Thus, I use industry-level enterprise birth rate (EBR) data as a proxy for IEoS. If an industry has high EBR but simultaneously equally high or even higher enterprise death rate (EDR), newly entering firms can expect profit in the long-run since the total number of competitors either remains the same or decreases. However, if an industry has high EBR but low EDR, then the number of competitors are continuously increasing, thereby making monopolistic behavior difficult. Therefore, I subtract EDR from EBR because the focus of this paper is more on the competition between firms within an industry.

For EEoS, I utilize the total amount of R&D expenses in each industry as the proxy. As

[13] In Demsetz (1982), economists like Joe Bain and James Ferguson correlates barriers to entry with economies of scale and monopoly return. In contrast, George Stigler argues that as long as firms can afford the upfront cost, "barriers" do not have to constitute economies of scales.

explained in the theory section of this paper, EEoS industries typically have substantial information and technology spillovers across individual firms, which makes domestic producers more favorable to inward FDI. Industries with external economies of scale are more likely to influence each other on account of being geographically close to one another. This agglomeration is more often witnessed in industries that are highly dependent on R&D investment (Feldman, 1999; Branstetter, 2006). Thus, the more R&D intense an industry is, the more likely it is EEoS industry.

Orbis Firm Data

In the third dataset, I use firm-level data of fixed assets and R&D expenses collected from the *Orbis* database. I only included companies whose stocks are publicly listed because the financial information of these companies is typically more reliable than that of companies that are unlisted. Once I sorted out the publicly listed companies of all 36 OECD countries, I obtained a total of 18,309 companies. Further, I collected information on the relevant accounting details including fixed assets, total assets, and research and development (R&D) expense as a share of operating revenue. I downloaded this information from the years 2010 to 2017 to match with the FDI restrictiveness index variable. Then, I sorted the companies according to the industry categorization of the FDI index, which yielded a total of 21 industries. Finally, I take the average values of all the companies by each industry. While some highly advanced economies such as the U.S. and most of the Western European countries have data for all 21 industries, some others such as Estonia, Latvia, Lithuania, Slovakia, and Slovenia have only 15-20 industries available.

For IEoS proxy, I use fixed assets as a share of total assets. By definition, fixed assets refer to a long-term tangible property or equipment that is required for a firm's production. Examples of fixed assets include buildings, machinery, computer equipment, land, furniture, and vehicles. According to Wright and Zhu (2018), "large capital requirements and substantial economies of scale in sunk costs associated with fixed asset investments constitute barriers for potential entrants, resulting in market concentration." Therefore, I use the average percentage of fixed assets as a share of average total assets (of all companies within an industry) as a proxy for IEoS. In addition, I utilize R&D expenses as a share of operating revenue as a proxy for EEoS.[14] I also utilize total amount of intangible assets, such as intellectual property or brand name, as the second EEoS proxy in the Orbis data.

Control Variables

I include several control variables at the country level, which could be sources of alter-

[14]Operating revenue is different from total revenue in that the income is strictly obtained from the business activities conducted by the producer. For example, a law firm's income generated by its lawyers' legal services is an operating revenue, but gifts from one of the clients are considered as a non-operating revenue.

native explanation for FDI restrictiveness. I include four control variables: *GDPPC (log)*, GDP Growth (%), Population (% of age 15-64), *Import as % share of GDP*, *Outward FDI as % share of GDP*, and *Security Industries*. GDP per capita reflects the level of economic advancement of different countries. Countries with higher GDP per capita are less likely to impose high FDI restrictions. GDP growth rate is included to control for the country-level economic shock to each industry. Next, I also include logged population in order to reflect both the market size and the pool of possible workforce. Countries with a larger population would be more open towards inward FDI due to higher demand for foreign goods and job creation. Third, I include import as a percentage of GDP, because countries that import intermediate goods from abroad are more likely to be open to FDI due to the integration of the global supply chain. I also include inward FDI as a percentage of GDP to control the extent to which a country is reliant on FDI. All the variables are downloaded from the World Development Indicators by the World Bank database. Finally, I include a dummy variable (*Security*) for three industries that are sensitive due to concerns around national security. These are mining and quarrying, electricity, and transportation (air and maritime).

Empirical Model

For all the regressions, I employ linear mixed-effects (multilevel) model for the empirical analysis to account for group-level (country-level) variations. The model can be specified in the following manner:

$$y_{ijt} = \alpha_j + \beta X_{ijt} + \eta U_{jt} + \gamma W_{ijt} + \delta Z_i + \epsilon_{ijt} \tag{10}$$

Equation (10) is the regression model for the empirical analysis in this paper. $i = 1, ..., n$ represents each industry within a country, $j = 1, ..., J$ represents 36 OECD countries, and t represents time period from 2010 to 2017. The random intercept α varies by country-level. β is the fixed effects coefficient for either IEoS or EEoS (X_{it}), which are unit- (industry), group- (country), and time-varying. Industry and time are considered fixed in the model. η is the coefficient for country-level economic predictors, U (GDP per capita, GDP growth, and population aged between 15 and 64 years as a share of total population). γ is the coefficient for all industry, country, and time-varying predictors (import as share of GDP and outward FDI a as share of GDP) that accounts for how much an industry within a country is integrated to the global economy. Finally, δ is the industry-varying coefficient for security-sensitive industries, which includes oil and mining, electricity, telecommunication, and transportation. $Z = 1$ if it is a security-sensitive industry.

5.3 Results and Findings

In Table 2.3, I present the regression results of three different proxies for IEoS and the FDI restrictiveness index (FDI index), which includes relevant control variables. All four models indicate that industry concentration leads to higher FDI restrictiveness. The first model, column (1), presents the industry concentration of the top 20 firms in the U.S. applied to 36 OECD countries. The coefficient on industry concentration is positive and statistically significant, thereby suggesting that the higher market share of large companies has a positive effect on FDI regulation. In the second column, I present a model using net enterprise birth rates (EBR) as an IEoS proxy. Since IEoS involves high barriers to entry, net EBR and FDI index should have a negative correlation. The result indeed indicates a negative coefficient, where a unit increase in birthrate leads to a decrease of 0.2% in the FDI index. Model (3) indicates the regression result of the third proxy for IEoS, which is the average percentage of fixed assets in total assets. This variable is also positively and significantly associated with the FDI index, thereby indicating that industries with firms that spend much on fixed assets – such as land, buildings, and equipment – are more likely to have higher FDI restrictions. Thus, the results in Table 2.3 support my first hypothesis that industries with higher internal economies of scale are more likely to be associated with higher FDI restrictiveness.

Further, the models in Table 2.3 also include a few crucial economic control variables as well as a dummy variable for security-sensitive industries. GDPPC (log), GDP growth, percentage of population aged between 15 and 64 years, and outward FDI (as a share of GDP) do not show any statistical significance, except for GDP growth in the first model where it is positively associated with FDI restrictiveness index. The positive correlation between growth rate and FDI restrictions is because countries with high growth rates tend to be less economically advanced and they are more likely to have higher FDI restrictions. Imports as a share of GDP consistently shows positive and significant association with the FDI restrictiveness index. A possible explanation for this finding is that MNCs are more likely to establish their foreign subsidiaries in countries where they export (from host countries' view, import) the most. Finally, coefficients for security-sensitive industries − electricity distribution, electricity generation, air and maritime transportation − are positive and statistically significant in all models, thereby indicating that the host government's security reviews on certain industries is well reflected in the FDI index data.[15] While regression results for IEoS proxies are consistent, the coefficient for EEoS proxy – R&D expenses – in model (4) does not have statistical significance, although it shows negative association. Table 2.4 presents more detailed results for EEoS proxies.

[15] A good example of this would be the Committee on Foreign Investments in the U.S.

Table 3: The Effect of IEoS on FDI Restrictiveness Index

	Dependent variable: The FDI Restrictiveness Index			
	US Data	OECD Data	Orbis Data	
	(1)	(2)	(3)	(4)
Industry Concentration	0.108***			
	(0.041)			
Net Enterprise Birth Rate		−0.002*		
		(0.001)		
Fixed Assets			0.114***	0.110***
(% of Total Assets)			(0.013)	(0.013)
R&D Expense				−0.001
(% of Operating Revenue)				(0.001)
GDPPC (log)	0.023	0.013	−0.00003	0.001
	(0.015)	(0.016)	(0.015)	(0.015)
GDP Growth	0.008**	0.001	0.001	0.001
	(0.003)	(0.001)	(0.001)	(0.001)
Population	0.004	0.005	0.002	0.001
(aged between 15 and 64)	(0.004)	(0.003)	(0.003)	(0.003)
Imports	−0.001*	−0.001*	−0.001***	−0.001**
(% of GDP)	(0.0004)	(0.0003)	(0.0003)	(0.0003)
Outward FDI	−0.002	−0.0002	0.0001	0.0001
(% of GDP)	(0.002)	(0.001)	(0.001)	(0.001)
Security-sensitive	0.104***	0.089***	0.119***	0.095***
	(0.016)	(0.006)	(0.006)	(0.006)
Constant	−0.463	−0.354	−0.070	−0.044
	(0.363)	(0.267)	(0.246)	(0.243)
Observations	756	2,567	4,428	4,285
Log Likelihood	289.139	1,552.029	2,001.199	2,101.646
Akaike Inf. Crit.	−554.278	−3,084.059	−3,982.399	−4,181.293
Bayesian Inf. Crit.	−498.742	−3,025.554	−3,918.442	−4,111.301

Note: *p<0.1; **p<0.05; ***p<0.01

Table 4: The Effect of EEoS on FDI Restrictiveness Index

	Dependent variable: The FDI Restrictiveness Index				
	U.S. data	OECD data	Orbis data		
	(1)	(2)	(3)	(4)	(5)
Geographic Concentration	−0.025				
	(0.114)				
R&D Expense (log)		−0.004***			
		(0.001)			
R&D Expense			−0.002**		
(% of Operating Revenue)			(0.001)		
Intangible Assets (log)				−0.002***	−0.002***
				(0.001)	(0.001)
Fixed Assets					0.118***
(% of Total Assets)					(0.013)
GDPPC (log)	0.028	0.010	0.006	0.007	0.003
	(0.017)	(0.013)	(0.015)	(0.015)	(0.015)
GDP Growth	0.011***	0.001	0.001	0.001	0.001
	(0.004)	(0.001)	(0.001)	(0.001)	(0.001)
Population	0.007	0.0004	0.001	0.002	0.002
(aged between 15 and 64)	(0.005)	(0.002)	(0.003)	(0.003)	(0.003)
Imports	−0.001***	−0.001**	−0.001**	−0.001**	−0.001***
(% of GDP)	(0.0004)	(0.0003)	(0.0003)	(0.0003)	(0.0003)
Outward FDI	−0.002	−0.0002	−0.00004	0.00003	0.0001
(% of GDP)	(0.002)	(0.0005)	(0.001)	(0.001)	(0.001)
Security-sensitive	0.168***	0.004	0.108***	0.133***	0.119***
	(0.017)	(0.006)	(0.006)	(0.006)	(0.006)
Constant	−0.627	−0.027	−0.058	−0.078	−0.075
	(0.426)	(0.201)	(0.243)	(0.246)	(0.246)
Observations	756	3,066	4,459	4,590	4,413
Log Likelihood	265.259	2,487.359	2,146.299	2,027.724	1,985.970
Akaike Inf. Crit.	−510.518	−4,954.717	−4,272.598	−4,035.448	−3,949.941
Bayesian Inf. Crit.	−464.238	−4,894.436	−4,208.571	−3,971.132	−3,879.625

Note: *p<0.1; **p<0.05; ***p<0.01

In Table 2.4, I present the linear mixed effects results for the analysis of EEoS. Model (1) shows the first EEoS proxy, which is the U.S. firms' geographic concentration by industry. While the coefficient indicates a negative correlation with the FDI index, it does not have statistical significance. Model (2) presents the effect of the logged total amount of R&D expense in an industry on FDI restriction. As expected, industries with high R&D expenses are more likely to have lower FDI regulation. The third proxy for EEoS, which is also the amount of R&D expense but is measured as a share of operating revenue, reveals a negative and statistically significant correlation with the FDI restrictiveness index. This implies that industries with R&D intense firms are more likely to have lower FDI restrictiveness. Finally, model (4) indicates that firms with high intangible assets – which includes intellectual property rights, copyrights, and human capital – are more likely to be associated with a lower FDI index. This result is consistent when I include an IEoS proxy (% of fixed asset in total asset). Therefore, the regression results in Table 2.4 strongly support my second hypotheses that EEoS industries are associated with lower FDI restrictiveness.

The control variables in models (1) through (5) in Table 2.3 indicate very similar results to that of Table 2.4. Countries that are more dependent on imports are more likely to have lower FDI restrictions, and security-sensitive industries – mining and quarrying, electricity, and air and water transportation – continue to show positively and statistically significant correlations with the FDI restrictiveness index, with the exception of model (2). The tendency of imposing high restrictions on certain industries are, in fact, explicitly expressed in 'Annex B' of the OECD Code of Liberalisation of Capital Movements.[16]

6 Other Indicators of FDI Openness/Regulation

In this section, I test the effect of IEoS and EEoS on FDI regulations by using three different measures of FDI openness − total number of bilateral investment treaties, World Bank Ease of Doing Business Scores, and Shatz (2000) FDI openness scores. While these measures are great indicators for FDI openness at a country-level, they do not provide information at an industry-level. Thus, for the independent variables, I aggregate the industry-level numbers into country-level variables by taking the average across industries within each country. Moreover, I selected the independent variables that showed the strongest statistical support for the hypotheses. For IEoS, I used industry concentration, share of fixed assets (as % of total assets), and share of tangible assets (as % of total assets). For EEoS, I used R&D

[16]For more information, visit the following link: `http://www.oecd.org/daf/inv/investment-policy/Code-capital-movements-EN.pdf`. Annex B (pp. 43-118) includes reservations lodged by individual OECD member states to the Code. While most languages are very vague, a few countries explicitly indicate industries or sectors that are considered sensitive to their national security and public order.

expenses, share of intangible assets (as % of total assets), and total amount of intangible assets (logged).

Number of Bilateral Investment Treaties

The first alternative indicator I used is the total number of bilateral investment treaties (BITs) in each country. For years 2010 to 2017, I summed all the BITs that were "in force" in 36 OECD member states. BITs are commonly signed between a developed and a developing country in an attempt to increase the FDI flows to the developing country, thereby signaling credible commitment to protect foreign MNCs (Kerner, 2009; Büthe and Milner, 2008; Busse et al., 2010; Tobin and Rose-Ackerman, 2011). Thus, the number of BITs signed serves as another indicator for FDI openness in developing countries. However, BITs can also serve as a good indicator for FDI openness in high-income (developed) countries, because they reaffirm or create new legal rights and provide additional avenues for resolving disputes with host countries regarding tax, regulation, and other indirect forms of harm to foreign corporations. They also guarantee national treatment, which prevents discrimination against foreign affiliates. Therefore, the total number of BITs works nicely as an indicator for FDI openness in OECD countries.

Table 2.5 presents the results of IEoS and the number of BITs in force. While only half of the proxies support my hypotheses, the negative and positive signs of the coefficients provide expected results. Models (2) and (3) of Table 2.5 support my first hypothesis that industries where firms experience higher IEoS would have higher FDI regulations. Since the number of BITs indicate openness for FDI, it makes sense that the share of fixed assets and tangible assets are negatively associated with the numbers of BITs. Thus, according to models (2) and (3), countries with industries that are more characterized by IEoS in general tend to have lower FDI openness. Moreover, model (6) also supports my second hypothesis that industries where firms experience higher external economies of scales would have lower FDI regulations. The amount of intangible assets associated with higher numbers of BITs reflect my argument on EEoS and FDI regulations. In other words, countries with industries that are, in general, more characterized by EEoS tend to have higher FDI openness.

World Bank 'Ease of Doing Business' Scores

The World Bank's scores on *Ease of Doing Business* is another great indicator for FDI openness/regulations.[17] *Ease of Doing Business* score calculates the regulatory environment of a country based on the evaluation of several criteria: starting a business, dealing with construction permits, registering property, protecting minority investors, paying taxes, trading across borders, etc. The score is reflected on a scale of 0 to 100, where 0 is the

[17]For more information, visit `https://www.doingbusiness.org/en/data/doing-business-score`

Table 5: Economies of Scale and BITs

	Dependent variable:					
	The Total Number of BITs In Force					
	(1)	(2)	(3)	(4)	(5)	(6)
Industry Concentration	−1.13					
	(1.89)					
Fixed Assets		−51.00*				
(% of Total Assets)		(27.34)				
Tangible Assets			−85.17***			
(% of Total Assets)			(18.59)			
R&D Expense				0.96		
				(1.32)		
Intangible Assets					13.76	
(% of Total Assets)					(24.43)	
Intangible Assets						3.87***
(log)						(0.76)
Observations	94	282	282	282	282	282
R^2	0.004	0.013	0.071	0.002	0.001	0.088
Adjusted R^2	−0.029	−0.016	0.044	−0.027	−0.028	0.061
Note:				*p<0.1; **p<0.05; ***p<0.01		

lowest and 100 is the highest regulatory performance. While the *Ease of Doing Business* score covers all local entrepreneurs, including both domestic and foreign firms, it represents the level of institutional attractiveness, which is the most important determinant for inbound FDI. Therefore, I expect the *Ease of Doing Business* score will closely resemble the FDI-friendly/regulatory environment.

Table 6: Economies of Scale and Ease of Doing Business

	Dependent variable:					
	WB: Ease of Doing Business Scores					
	(1)	(2)	(3)	(4)	(5)	(6)
Industry Concentration	−0.10					
	(0.36)					
Fixed Assets		−0.35				
(% of Total Assets)		(5.64)				
Tangible Assets			−13.75***			
(% of Total Assets)			(3.86)			
R&D Expense				2.34***		
				(0.23)		
Intangible Assets					30.77***	
(% of Total Assets)					(4.61)	
Intangible Assets						0.52***
(log)						(0.16)
Observations	97	284	284	284	284	284
R^2	0.001	0.00001	0.044	0.268	0.139	0.036
Adjusted R^2	−0.031	−0.029	0.016	0.247	0.114	0.008
Note:				*p<0.1; **p<0.05; ***p<0.01		

Table 2.6 presents the relationship between two types of economies of scales and the ease of doing business scores. While models (1) and (2) do not indicate statistical significance, the negative signs of the coefficients do reflect my first hypothesis that IEoS industries are more likely to have higher FDI restrictiveness (or a less business-friendly environment). Model (3) strongly supports my argument on IEoS and FDI restrictiveness. Countries with industries that are, in general, more characterized by IEoS (higher share of tangible assets) are less

likely to have a business-friendly environment (higher FDI restrictiveness). Models (4), (5), and (6) all strongly support my second hypothesis on EEoS and FDI regulations. According to the models (4)–(6), countries with industries that are, in general, more characterized by EEoS (total R&D expenses, share of intangible assets, and total amount of intangible assets) are more likely to be associated with a more business friendly environment (lower FDI restrictiveness).

Shatz's (2000) FDI Openness Scores

The third FDI regulation indicator I used was obtained from Shatz (2000).[18] The author developed an annual rating of the FDI openness of 56 countries (excluding Netherlands Antilles) from 1986 to 1995. Shatz particularly examined the following three administrative components that are relevant to inward FDI: "first rates a country on the simplicity of its approval process; second rates a country on the ability of foreigners to acquire domestically owned firms; and the final component rates a country on the freedom to remit profits and repatriate capital."[19] While the years do not match with the independent variables, Shatz's FDI openness score still works as an alternative measure for FDI restrictiveness, as it assumes that each country's FDI regulatory environment does not change dramatically over time. Since the years do not match, I use the average across years. In addition, 10 countries were excluded because the scores did not exist in Shatz (2000).[20]

Table 2.7 presents the regression results of the effect of two economies of scales on Shatz's FDI openness scores. Models (3) and (5) provide support for my two hypotheses, while others are statistically insignificant. In model (3), the share of tangible assets, a proxy for internal economies of scale, shows a negative association with the FDI openness score. This implies that countries that tend to have industries with high IEoS have higher FDI restrictiveness. When examining model (5), the proportion of of intangible assets indicate a positive relationship with the FDI openness score, which implies that countries that are more characterized by industries with high EEoS are more likely to have lower FDI restrictiveness. However, due to a lack of sufficient observations, the overall results are not as strong as the regression results from the scores of the number of BITs and *Ease of Doing Business* scores.

[18] See Shatz, H. J. (2000). The location of united states multinational affiliates (Order No. 9972497). Available from ABI/INFORM Collection; ProQuest Dissertations & Theses Global. (304599730). Retrieved from `https://proxy.lib.umich.edu/login?url=https://search.proquest.com/docview/304599730?accountid=14667`

[19] Shatz (2000), p.172.

[20] These countries are: the Czech Republic, Estonia, Hungary, Iceland, Lithuania, Latvia, Poland, Slovenia, Slovakia, and the United States.

Table 7: Economies of Scale and FDI Openness

	Dependent variable:					
	Shatz (2000) FDI Openness Score					
	(1)	(2)	(3)	(4)	(5)	(6)
Industry Concentration	−0.03					
	(0.05)					
Fixed Assets		2.12				
(% of Total Assets)		(2.87)				
Tangible Assets			−5.81**			
(% of Total Assets)			(2.22)			
R&D Expense				0.14		
				(0.17)		
Intangible Assets					4.78**	
(% of Total Assets)					(2.05)	
Intangible Assets						0.10
						(0.11)
Observations	24	26	26	26	26	26
R^2	0.012	0.022	0.221	0.026	0.184	0.035
Adjusted R^2	−0.033	−0.018	0.189	−0.015	0.150	−0.005
Note:						*p<0.1; **p<0.05; ***p<0.01

7 Conclusion

This paper explores a relatively understudied aspect of the literature on the politics of FDI. While existing studies have made much progressed on numerous topics – such as the determinants of inbound FDI, FDI preferences based on distributive consequences, as well as the strategic actions of foreign multinational corporations – the importance of industrial structure on FDI regulation has been rather neglected in the field of international political economy. Industrial features, however, are crucial in shaping attitudes towards restrictions on inbound FDI by domestic producers. In this paper, I provide a rigorous new theoretical framework using two distinct types of economies of scale. IEoS industries typically exhibit an oligopolistic market where only a few number of large companies co-exist. When facing a disruption in the market equilibrium that will is likely to cause a negative affect on their profits, these domestic firms demand the government to institute a more restrictive inward FDI policy. In contrast, in industries where firms experience external economies of scale, the demand for restrictive inward FDI policy diminishes either because these markets resemble perfect competition and thus, the additional entry of competitors does not make much difference to the market equilibrium or because the disruption in the equilibrium brings higher profit.

Through formal and empirical analysis, I found support for my theory emphasizing the importance of economies of scale. Under the differentiated Cournot triopoly, the extent of IEoS leads to an increase in the FDI regulations while the extent of EEoS leads to a decrease in the FDI regulations imposed by the host government that favors the interests of domestic producers over consumer utility. In the empirical analysis, I showed that industries with IEoS – measured by industry concentration, lower number of new entrants entrance of new enterprises, and high fixed assets as a share of total assets – lead to higher FDI restrictiveness. Moreover, industries with EEoS – measured by industry geographic concentration of firms, R&D expenses as a share of operating revenues, and total amount of intangible assets – are associated with lower FDI restrictiveness. Therefore, industry characteristics and how the market equilibrium is affected by inward FDI are crucial elements in understanding the variation in FDI restrictiveness across both industries and countries.

The research on FDI regulation directly reflects contemporary international economic relations: a wave of resurgent nationalism and newly aggressive industrial policies in developed countries. While inward FDI regulations have been subtle in developed countries, the recent series of events in the advanced economies – such as Brexit, the US-China trade war, and the COVID-19 crisis – countries are beginning to adopt apparent barriers against FDI. In addition, as observed from the case of Huawei's 5G network, countries are demanding that

foreign firms must divest when national security concerns are at hand. Such discrimination against foreign firms are likely to rise in the near future, particularly in the information, communication, and technology (ICT) sector, which is closely related to sensitive and strategic technology. However, industrial feature that is crucial to the determinant of FDI has been understudied in the field of international political economy. Thus, my research can offer explanation to the causes of FDI protectionism across industries and countries.

That said, the study on FDI regulation and industrial features needs to be further refined by examining FDI by different entry mode strategies, inter-industry activities, and types of countries. How are greenfield investments and cross-border M&As regulated differently by developed countries? Would inter-industry activities matter in whether one industry supports FDI in another industry? Finally, while I focused on developed countries in this paper, would the same FDI regulation patterns be evident across industries in developing countries? Future research should address how FDI regulations are affected by various other contingencies that originate from other economic actors and domestic institutional structures.

References

Aitken, B. J. and Harrison, A. E. (1999). Do domestic firms benefit from direct foreign investment? evidence from venezuela. *American economic review*, 89(3):605–618.

Alcácer, J. and Chung, W. (2014). Location strategies for agglomeration economies. *Strategic Management Journal*, 35(12):1749–1761.

Arnold, J. M. and Javorcik, B. S. (2009). Gifted kids or pushy parents? foreign direct investment and plant productivity in indonesia. *Journal of International Economics*, 79(1):42–53.

Arrow, K. J. (1971). The economic implications of learning by doing. In *Readings in the Theory of Growth*, pages 131–149. Springer.

Branstetter, L. (2006). Is foreign direct investment a channel of knowledge spillovers? evidence from japan's fdi in the united states. *Journal of International economics*, 68(2):325–344.

Busse, M., Königer, J., and Nunnenkamp, P. (2010). Fdi promotion through bilateral investment treaties: more than a bit? *Review of World Economics*, 146(1):147–177.

Büthe, T. and Milner, H. V. (2008). The politics of foreign direct investment into developing countries: increasing fdi through international trade agreements? *American journal of political science*, 52(4):741–762.

Büthe, T. and Milner, H. V. (2009). Bilateral investment treaties and foreign direct investment: A political analysis. *The effect of treaties on foreign direct investment: Bilateral investment treaties, double taxation treaties, and investment flows*, pages 171–225.

Caballero, R. J. and Lyons, R. K. (1990). Internal versus external economies in european industry. *European Economic Review*, 34(4):805–826.

Cantwell, J. (2009). Location and the multinational enterprise. *Journal of international business studies*, 40(1):35–41.

Chari, A. and Gupta, N. (2008). Incumbents and protectionism: The political economy of foreign entry liberalization. *Journal of financial economics*, 88(3):633–656.

Chwo-Ming, J. Y. and Ito, K. (1988). Oligopolistic reaction and foreign direct investment: The case of the us tire and textiles industries. *Journal of International Business Studies*, 19(3):449–460.

Ciccone, A. and Hall, R. E. (1993). Productivity and the density of economic activity. Technical report, National Bureau of Economic Research.

Demsetz, H. (1982). Barriers to entry. *The American economic review*, 72(1):47–57.

Feldman, M. P. (1999). The new economics of innovation, spillovers and agglomeration: A review of empirical studies. *Economics of innovation and new technology*, 8(1-2):5–25.

Ghemawat, P. and Thomas, C. (2008). Strategic interaction across countries and multinational agglomeration: An application to the cement industry. *Management Science*, 54(12):1980–1996.

Girma, S. and Görg, H. (2007). Evaluating the foreign ownership wage premium using a difference-in-differences matching approach. *Journal of International Economics*, 72(1):97–112.

Görg, H. and Strobl, E. (2003). Multinational companies, technology spillovers and plant survival. *Scandinavian Journal of Economics*, 105(4):581–595.

Grossman, G. and Helpman, E. (1994). Foreign investment with endogenous protection. Technical report, National Bureau of Economic Research.

Hanson, G. H. (2001). Scale economies and the geographic concentration of industry. *Journal of Economic Geography*, 1(3):255–276.

Harris, R. and Robinson, C. (2003). Foreign ownership and productivity in the united kingdom estimates for uk manufacturing using the ard. *Review of Industrial organization*, 22(3):207–223.

Head, K., Ries, J., and Swenson, D. (1994). Agglomeration benefits and location choice: Evidence from japanese manufacturing investment in the united states. Technical report, National Bureau of Economic Research.

Henderson, J. V. (2003). Marshall's scale economies. *Journal of urban economics*, 53(1):1–28.

Henisz, W. J. (2000). The institutional environment for multinational investment. *The Journal of Law, Economics, and Organization*, 16(2):334–364.

Hennart, J.-F. and Park, Y.-R. (1993). Greenfield vs. acquisition: The strategy of japanese investors in the united states. *Management science*, 39(9):1054–1070.

Hillman, A. L. (1982). Declining industries and political-support protectionist motives. *The American Economic Review*, 72(5):1180–1187.

Hymer, S. H. (1976). *International operations of national firms*. MIT press.

Ito, K. and Rose, E. L. (2002). Foreign direct investment location strategies in the tire industry. *Journal of International Business Studies*, 33(3):593–602.

Javorcik, B. S. and Spatareanu, M. (2005). Disentangling fdi spillover effects: what do firm perceptions tell us? *Does foreign direct investment promote development*, pages 45–72.

Jensen, N. (2008). Political risk, democratic institutions, and foreign direct investment. *The Journal of Politics*, 70(4):1040–1052.

Jensen, N., Biglaiser, G., Li, Q., and Malesky, E. (2012). *Politics and foreign direct investment*. University of Michigan Press.

Jensen, N. M. (2003). Democratic governance and multinational corporations: Political regimes and inflows of foreign direct investment. *International organization*, pages 587–616.

Johns, L. and Wellhausen, R. L. (2016). Under one roof: Supply chains and the protection of foreign investment. *American Political Science Review*, 110(1):31–51.

Kerner, A. (2009). Why should i believe you? the costs and consequences of bilateral investment treaties. *International Studies Quarterly*, 53(1):73–102.

Knickerbocker, F. T. (1973). Oligopolistic reaction and multinational enterprise. *The International Executive*, 15(2):7–9.

Larimo, J. (2003). Form of investment by nordic firms in world markets. *Journal of Business Research*, 56(10):791–803.

Ledvina, A. F. and Sircar, R. (2011). Bertrand and cournot competition under asymmetric costs: number of active firms in equilibrium. *Available at SSRN 1692957*.

Li, Q. and Resnick, A. (2003). Reversal of fortunes: Democratic institutions and foreign direct investment inflows to developing countries. *International organization*, 57(1):175–211.

Li, Q. and Vashchilko, T. (2010). Dyadic military conflict, security alliances, and bilateral fdi flows. *Journal of International Business Studies*, 41(5):765–782.

Malesky, E. J. and Mosley, L. (2018). Chains of love? global production and the firm-level diffusion of labor standards. *American Journal of Political Science*, 62(3):712–728.

Marcin, K. (2008). How does fdi inflow affect productivity of domestic firms? the role of horizontal and vertical spillovers, absorptive capacity and competition. *The Journal of International Trade & Economic Development*, 17(1):155–173.

Marshall, A. (2009). *Principles of economics: unabridged eighth edition*. Cosimo, Inc.

Owen, E. (2013). Unionization and restrictions on foreign direct investment. *International Interactions*, 39(5):723–747.

Owen, E. (2015). The political power of organized labor and the politics of foreign direct investment in developed democracies. *Comparative Political Studies*, 48(13):1746–1780.

Pandya, S. S. (2010). Labor markets and the demand for foreign direct investment. *International Organization*, 64(3):389–409.

Pandya, S. S. (2014). *Trading spaces*. Cambridge University Press.

Pandya, S. S. (2016). Political economy of foreign direct investment: Globalized production in the twenty-first century. *Annual Review of Political Science*, 19:455–475.

Pinto, P. M. (2013). *Partisan investment in the global economy: Why the left loves foreign direct investment and FDI loves the left*. Cambridge University Press.

Pinto, P. M. and Pinto, S. M. (2008). The politics of investment partisanship: And the sectoral allocation of foreign direct investment. *Economics & Politics*, 20(2):216–254.

Rauch, J. E. (1993). Productivity gains from geographic concentration of human capital: evidence from the cities. *Journal of urban economics*, 34(3):380–400.

Romer, P. M. (1990). Endogenous technological change. *Journal of political Economy*, 98(5, Part 2):S71–S102.

Shatz, H. J. (2000). The location of united states multinational affiliates. (doctoral dissertation). *Harvard University*.

Slangen, A. and Hennart, J.-F. (2007). Greenfield or acquisition entry: A review of the empirical foreign establishment mode literature. *Journal of international management*, 13(4):403–429.

Tobin, J. L. and Rose-Ackerman, S. (2011). When bits have some bite: The political-economic environment for bilateral investment treaties. *The Review of International Organizations*, 6(1):1–32.

Wright, J. and Zhu, B. (2018). Monopoly rents and foreign direct investment in fixed assets. *International Studies Quarterly*, 62(2):341–356.

Zejan, M. C. (1990). New ventures or acquisitions. the choice of swedish multinational enterprises. *The Journal of Industrial Economics*, pages 349–355.

8 Appendix

8.1 FDI Restrictiveness

Figure 4: FDI Restrictiveness By Country

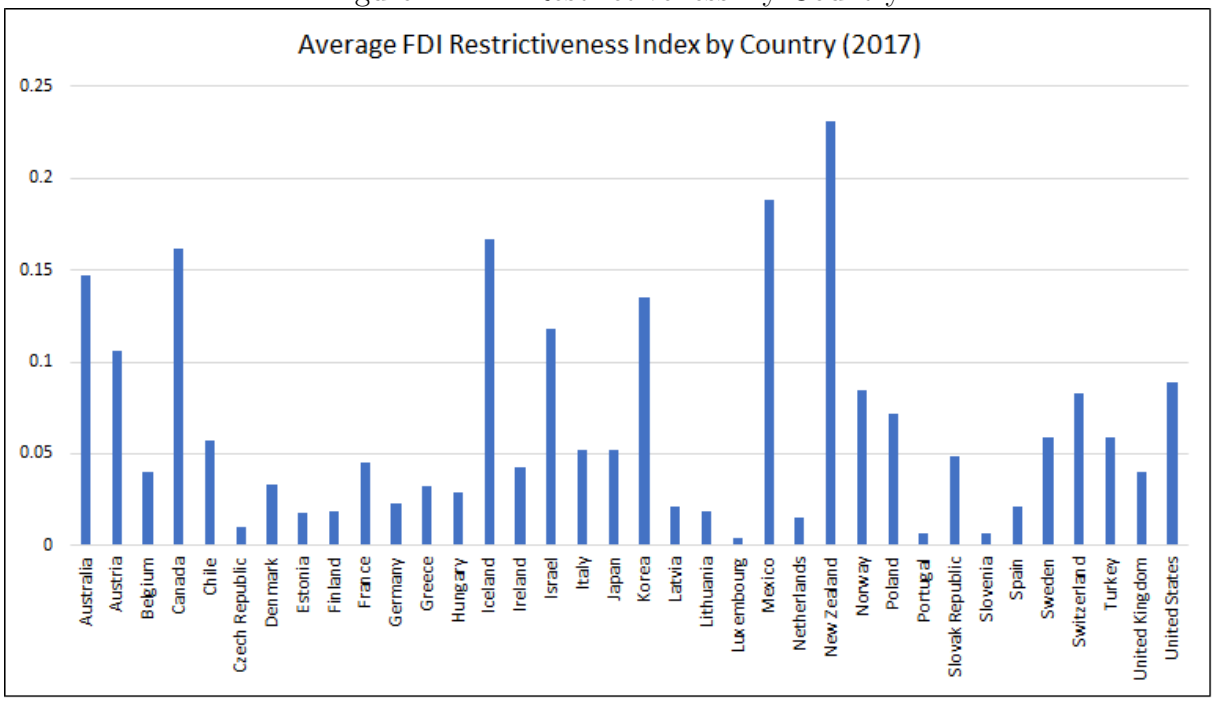
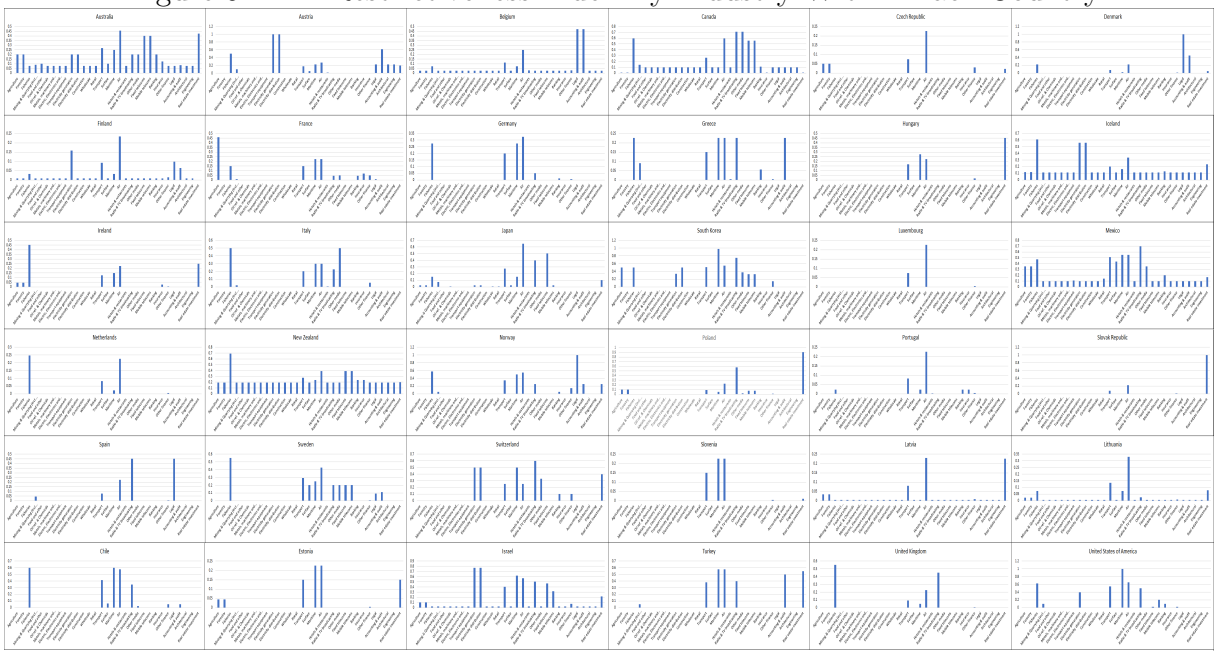


Figure 5: FDI Restrictiveness Index By Industry Within Each Country



8.2 Solving for Equilibrium Profits

Cournot Triopoly in an IEoS Industry

Equilibrium outputs for domestic and foreign firms are solved by maximizing equations (4) and (5) in terms of q_{d1}, q_{d2}, and q_f, respectively. This yields the following equilibrium quantity function for q^*_{d1}:

$$q^*_{d1} = \frac{(2\beta + \gamma - \theta) - \alpha\gamma}{(2\beta - \theta)(2\beta + 2\gamma - \theta)} \left\{ (\alpha - c) + \frac{(2\beta - \frac{1}{\tau}\gamma - \theta)\gamma c}{(2\beta - \gamma - \theta)} - 1 \right\} \tag{11}$$

Due to mathematical complexity, I use numerical values for certain parameters ($\alpha = 1$, $\beta = 1$, $\gamma = 0.5$, and $c = 1$) to express the following equilibrium output for each firm[21]:

$$q^*_{d1} = -\frac{\tau + 2(\tau - 1)(\theta - 2) - 1}{(\theta - 2)(\frac{1}{2(\theta-2)} + 1) + \frac{1}{4(\theta-2)} + \frac{1}{2}} \tag{12}$$

After setting $\frac{\tau+2(\tau-1)(\theta-2)-1}{(\theta-2)(\frac{1}{2(\theta-2)}+1)+\frac{1}{4(\theta-2)}+\frac{1}{2}} = A$, the following expression for q^*_f is obtained:

$$q^*_f = 4(\theta - 2) \left\{ 0.5A - \tau + \frac{\tau + 2(\tau - 1)(\theta - 2) - 1}{2(\theta - 2)(2\theta + \frac{1}{2\theta-4} - 2) + 1} + 1 \right\} \tag{13}$$

By setting $0.5A - \tau + \frac{\tau+2(\tau-1)(\theta-2)-1}{2(\theta-2)(2\theta+\frac{1}{2\theta-4}-2)+1} + 1 = B$, q^*_{d2} is simplified in the following equation:

$$q^*_{d2} = -\frac{A - 2(\theta - 2)B}{\theta - 2} \tag{14}$$

Next, equations (12)–(14) are each plugged into the following price function to obtain the equilibrium price for each firm:

$$p^*_{i\in(d1,d2,f)} = \alpha - \beta q^*_{i\in(d1,d2,f)} - \gamma(q^*_{j\neq i} + q^*_{k\neq i,j}) \tag{15}$$

Finally, the equilibrium profits of domestic and foreign firms can be obtained by solving the following profit functions (where $d \in (d1, d2)$):

$$\pi^*_d = p^*_d q^*_d - \left(c - \frac{1}{2}\theta q^*_d \right) q^*_d \tag{16}$$

$$\pi^*_f = p^*_d q^*_f - \left(\tau c - \frac{1}{2}\theta q^*_f \right) q^*_f \tag{17}$$

[21] All numerical solutions were done in Matlab

Cournot Triopoly in an EEoS Industry

Equilibrium outputs for domestic and foreign firms under EEoS industry are solved by maximizing equations (6) and (7) in terms of q_{d1}, q_{d2}, and q_f, respectively. This yields the following equilibrium quantity function for q^*_{d1} under EEoS[22]:

$$q^*_{d1} = \frac{(2\beta + (\gamma - \eta) - \theta) - \alpha(\gamma - \eta)}{(2\beta - \theta)(2\beta + 2(\gamma - \eta) - \theta)} \left\{ (\alpha - c) + \frac{(2\beta - \frac{1}{\tau}(\gamma - \eta) - \theta)(\gamma - \eta)c}{(2\beta - (\gamma - \eta) - \theta)} - 1 \right\} \quad (18)$$

Due to the complexity of the calculation, I use numerical values $\alpha = 1, \beta = 1, \gamma = 0.5, \theta = 0$, and $c = 1$ to solve the equilibrium output of each firm.

$$q^*_{d1} = \frac{0.5 - 0.5\tau - \eta(\tau - 1)}{0.25 - \eta^3 - 9/17\eta^2 + 4/17\eta} \quad (19)$$

Equilibrium functions of q^*_f and q^*_{d2} closely resembles that of q^*_{d1}:

$$q^*_f = \frac{\tau - 0.25q^*_{d1} + \eta^2 q^*_{d1} - 1}{(\eta - 0.5)^2} \quad (20)$$

$$q^*_{d2} = (0.5 - \eta) \left(q^*_{d1} - \frac{\tau - 0.25q^*_{d1} + \eta^2 q^*_{d1} - 1}{(\eta - 0.5)^2} \right) \quad (21)$$

By replacing equations (16) and (17) to the inverse demand functions of domestic and foreign firms, I obtain the equilibrium price for each firm: $p^*_{d_i}$ and p^*_f. The calculation process to solve the equilibrium profit for each firm ($\pi^*_{d_i}$ and π^*_f) is exactly the same as that of the Cournot triopoly under IEoS.

[22]Notice that the only term that changes is γ, which is now subtracted by the degree of EEoS, or η.

8.3 Description of the U.S. Census Bureau Data

1. OECD Countries (36): Australia, Austria, Belgium, Canada, Chile, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, the United Kingdom, and the United States.

2. Industries (21): Manufacturing, engineering, electricity generation, electricity distribution, wholesale, retail, hotels and restaurants, air transportation, water transportation, land transportation, mobile telecommunications, fixed telecommunications, radio and TV broadcasting, newspapers and print media, banking, insurance, other financial services, accounting and audit services, architectural services, legal services, and real estate

3. Summary Statistics

Table 8:

Statistic	N	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
FDI Index	756	0.093	0.182	0.000	0.000	0.110	1.000
Industry Conc	756	0.450	0.258	0.088	0.203	0.604	0.975
Geographic Conc	756	0.163	0.053	0.098	0.129	0.207	0.294
large_4	756	23.587	20.832	2.600	7.900	29.900	89.100
large_8	756	32.901	23.886	4.500	12.600	41.400	95.200
large_20	756	44.951	25.827	8.800	20.300	60.400	97.500
large_50	756	55.899	26.501	16.500	28.000	81.900	98.800

8.4 Description of the OECD Data

1. Countries (36): Australia, Austria, Belgium, Canada, Switzerland, Chile, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Republic of Korea, Latvia, Lithuania, Luxembourg, Mexico, Netherlands, Norway, New Zealand, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Turkey, the United Kingdom, and the United States.

2. Industries in Enterprise Birth Rate Data (11): Mining and Quarrying, Manufacturing, Electricity, Construction, Distribution, Hotels and Restaurants, Telecommunication, Transportation, Financial Services, Business Service, and Real Estate.

3. Industries in R&D Expenses Data (18): Primary (Agriculture, Forestry, and Fishing), Mining and Quarrying, Food and other manufacturing, Oil and Chemicals manufacturing, Metals and non-metals manufacturing, Transportation Equipment, Electronics and Machinery, Construction, Electricity, Distribution, Hotels and Restaurants, Transportation, Telecommunications, Radio and TV broadcasting, Other Media, Financial Services, Business Services, and Real Estate

4. Summary Statistics

Table 9:

Statistic	N	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
Year	7,131	2,013.400	2.172	2,010	2,011	2,015	2,017
R&D	3,369	65,027.810	945,415.100	0.000	12.408	926.800	30,444,869.000
EBR	2,797	10.508	5.929	0.000	7.100	12.700	72.500
EDR	2,797	10.261	5.791	0.000	7.000	12.400	72.500
EBR Net	2,797	0.247	1.875	−6.900	0.000	0.000	38.100
FDI Index	2,670	0.069	0.146	0.000	0.000	0.079	1.000
GDPPC (log)	2,937	10.423	0.589	9.301	9.891	10.836	11.685
GDP Growth	2,937	2.381	2.786	−4.028	1.255	3.318	25.163
Pop (15-64)	2,937	66.359	2.486	60.076	64.985	67.591	73.414
Imports	2,937	53.405	30.781	13.576	30.853	71.989	191.549
OFDI	2,937	3.515	9.480	−21.765	0.280	3.190	57.837
Security	2,937	0.182	0.386	0.000	0.000	0.000	1.000

8.5 Description of the Orbis Data

1. Countries (36): Australia, Austria, Belgium, Canada, Switzerland, Chile, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Republic of Korea, Latvia, Lithuania, Luxembourg, Mexico, Netherlands, Norway, New Zealand, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Turkey, the United Kingdom, and the United States.

2. Industries (28): Agriculture, Forestry, Fishieries, Mining and Quarrying, Food and other manufacturing, Oil and Chemicals manufacturing, Metals and non-metals manufacturing, Transportation Equipment, Electronics and Machinery, Construction, Electricity, Wholesale, Retail, Hotels and Restaurants, Air transportation, Maritime transportation, Surface transportation, Telecommunications, Radio and TV broadcasting, Other Media, Banking, Insurance, Other Financial Services, Accounting and Audit services, Architectural services, Legal services, Engineering services, and Real Estate

3. Summary Statistics

Table 10:

Statistic	N	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
fdi_index	4,760	0.085	0.172	0.000	0.000	0.100	1.000
year	5,008	2,013.500	2.292	2,010	2,011.8	2,015.2	2,017
sh_fc1	4,666	0.569	0.184	0.00000	0.446	0.705	1.000
lintangible	4,838	10.594	4.183	−6.908	9.283	13.152	17.025
lgdppc	4,760	10.464	0.593	9.076	10.052	10.851	11.685
growth	4,760	2.213	2.555	−9.132	1.333	3.063	25.163
pop_1564	4,760	66.191	2.564	60.076	64.847	67.382	73.414
sh_imp	4,760	43.519	27.205	13.576	28.578	48.718	191.549
sh_ofdi	4,760	3.201	7.448	−21.765	0.470	3.336	57.837
security	5,008	0.158	0.365	0	0	0	1