

## **Heterogeneous Multinational Firms and Investment Liberalization in Developing Economies \***

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### **Abstract:**

As developing economies have increasingly implemented investment liberalization to attract foreign investment, its impact on multinational firms is a crucial policy question. This paper seeks to quantify the response of individual multinational firms to a reduction in investment costs in developing countries. Calibrating the firm-heterogeneity model of Eaton, Kortum, and Kramarz (2011) to match micro-level data on Japanese multinational firms, we use the calibrated model to conduct a series of counterfactual policy experiments that reduce fixed or variable costs of foreign production. We find that the greater level of investment liberalization may produce larger welfare gains for the developing economies. In terms of the extensive and intensive margins, the policy reforms tend to induce more productive foreign firms to expand their local production to the larger extent. These results suggest a policy implication for investment targeting at the firm-level.

**Keywords:** FDI, Firm heterogeneity, Investment liberalization, Developing Country

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## 1. Introduction

The past decades have seen that a number of developing countries attempted to attract foreign direct investment (FDI) by removing foreign ownership restrictions and offering preferential investment incentives for foreign firms. To improve an investment environment, governments in the developing countries have taken a wide range of policy measures, including an establishment of industrial zones, infrastructure development, and fiscal incentives. Indeed, the prior evidence shows that the better investment climate encourages FDI activity (Markusen, 2004, Kinda, 2010). However, regulatory barriers to foreign investment in developing economies remain to be greater than in developed economies. According to the Investing-Across-Border survey in 2010 by the World Bank Group, the average length of investment processes for foreign investors was 20 days for 16 high income economies and 47 days for 71 middle and low income economies. Thus, investment processes are still significantly less efficient in the developing economies, which might discourage an entry and local production of multinational firms.

Regulatory reforms for foreign investors are a crucial policy issue for governments in developing economies in part because the policy reforms can reduce investment impediments in the relatively short period as compared with the relatively long-run process of improving market access and infrastructure. Thus, a key policy question is the impact of eliminating policy-related obstacles on inward foreign investment. However, we know little about how policy-driven reductions in investment costs will induce *individual* firms abroad to make direct investment and expand their offshore production. To address this question, this paper examines which firms in developed countries will respond to a reduction of investment barriers in the developing countries. An empirical investigation sheds light on the *ex ante* characteristics of multinational parent firms, possibly making it feasible to target investment incentives on a specific group of foreign firms that are most likely to respond to the regulatory reforms.

Our task in this paper is to quantify firm-level responses to investment liberalization in developing economies, which can be viewed as an aggregate shock in foreign markets for individual firms in a home country. Linking aggregate shocks and individual firm responses in a standard econometric framework is not impossible, but fairly difficult due to the lack of observable natural experiments. Thus, we employ a structural approach to simulate the response of heterogeneous firms to invest and produce offshore under counterfactual policy reforms in the developing countries. Specifically, we draw on the prior work in Arita and Tanaka (2012), where a firm-heterogeneity model of Eaton, Kortum, and Kramarz (2011, EKK hereafter) is calibrated to match data on Japanese multinational firms. The calibrated model is then used to conduct a series of counterfactual experiments.

We consider a hypothetical scenario in which only developing countries reduce investment barriers, but investment costs in developed countries remain constant. Specifically, we consider two cases for counterfactual policy experiments; (1) FDI barriers fall to the level of investment barriers faced by their domestic firms, and (2) FDI barriers decline to the level of investment barriers in developed countries. Additionally, we decompose the investment barriers into fixed and variable costs of offshore production by multinational firms. To link these theoretical measures with actual policy barriers, we relate the fixed cost to the length of investment procedures for foreign investors and the variable cost to the effective tax rate faced by foreign firms. Drawing on the estimated elasticity between FDI costs and actual measures of policy barriers, we translate the actual absolute reduction in these policy measures into a percentage point change in FDI costs, on which counterfactual scenarios are based.

Comparing the baseline and counterfactual simulations for each policy experiment, we can summarize our main findings as follows. First, economies with a larger reduction in their investment barriers tend to experience a welfare gain as measured by a change in real wages. The reason is that a larger inflow of foreign firms contributes to increase nominal wages and market competition in local markets. By contrast, economies with a negligible elimination of their investment obstacles could yield a welfare loss because their markets may become more unattractive than the other economies with a large decline in FDI barriers. Second, the policy experiments of eliminating entry barriers show different impacts on aggregate firm entries and sales in developing economies than those of reducing variable costs of local production. In terms of actual policy indicators, an improvement of investment processes appears to encourage a new entry of foreign investors more than a reduction of local tax burdens on foreign firms.

Finally, we find that individual firms respond differently to investment liberalization. When developing economies eliminate entry barriers, more productive firms tend to increase their entry to these markets, except for the most productive firms that have already penetrated them widely. The reason is that marginally productive producers below the entry threshold of productivity are the primary beneficiaries from lower entry barriers. The similar patterns in the response of individual firms can be observed for a reduction of local tax. In terms of the intensive margin, the firms in the upper middle productivity groups are likely to expand their local production most significantly across policy experiments.

This paper is related to the empirical studies on the determinants of FDI activity in developing economies. Asiedu (2002) examines whether FDI determinants in Africa differ from those in other regions. The findings show that return on capital, infrastructure development, and FDI openness may affect African countries differently from other countries. Kinda (2010) uses a firm-level data set to investigate the impact of investment climate on FDI in developing

countries. The results indicate that an improvement in physical infrastructure, financial constraints, and institutional barriers would encourage FDI activity. Additionally, Harding and Javorcik (2011) provide evidence that sector-specific investment promotion increases FDI inflows in developing countries, suggesting that the sector-targeting investment incentives are an effective policy option. Consistent with these empirical works, our findings imply that investment barriers deter foreign firms. By contrast, we extend the evidence by showing a strikingly different response of individual firms to a decline in investment costs. Our work indicates that firm-specific investment promotion may be a more effective policy for developing economies.

Another branch of related studies includes a structural approach to examine the impact of investment liberalization. Markusen (1997) and Egger et al. (2007) employ the knowledge capital model in which both national and multinational firms may exist under a wide range of factor endowments. They rely on numerical model simulations to analyze the impact of trade and investment liberalization on multinational activity and welfare in developing economies. Policy experiments are designed to examine a set of different liberalization scenarios at the arbitrary level of liberalization in trade and investment. Konan and Maskus (2006) study the impact of services liberalization on the Tunisia economy using a computable general equilibrium model. Barriers to foreign investment in service sectors are modeled as a combination of price wedges in cost inefficiency and market power of local firms in the absence of foreign firms. While a removal of these price wedges is defined as services liberalization, there is little objective information on services barriers, forcing them to rely on crude approximations gathered from the Tunisian industry studies to set the level of eliminating barriers. Additionally, Burstein and Monge-Naranjo (2009) develop a quantitative model to estimate the impact of eliminating policy barriers on foreign controls of domestic factors for production in developing economies.

While our paper is similar to these previous studies in the structural approach, it extends the prior approach by directly linking actual measures of policy barriers with theoretical measures of investment costs in the model. To conduct counterfactual analysis, it is necessary to identify a change in underlying costs of FDI activity under certain policy experiments. In the prior work, the magnitude of the cost changes is not necessarily determined on the basis of the actual change in policy barriers, but set at the arbitrary level. In this respect, we employ actual survey measures on FDI barriers and design the policy experiments under which a change in underlying FDI costs is based on a change in the survey measures.

The rest of this paper is organized as follows. Section 2 presents the methodological framework to conduct the counterfactual analysis. Section 3 discusses policy-related barriers on

foreign investment, followed by the estimation of a relationship between theoretical and survey measures of FDI barriers. Section 4 presents the counterfactual results under distinct policy experiments. Section 5 concludes.

## **2. Methodological Framework**

This section presents the methodological framework to analyze the response of individual firms to aggregate shocks. We explain the theoretical framework, calibration and model validation, and the general equilibrium framework for counterfactuals. While we discuss key elements of the framework that closely follows EKK (2011), details are found in Arita and Tanaka (2012).

### **2.1. Theoretical Framework**

In this study, we aim to empirically examine the response of individual firms to an aggregate change in investment costs abroad. To investigate multinational production at the firm-level, we adapt the heterogeneous firm model of EKK (2011). As we do not consider trade costs, we modify the EKK model by allowing firms to serve foreign markets solely via local production. By excluding the role of trade, we preclude a variety of alternative choices, including exports to a foreign market, intra-firm trade between parents and their foreign affiliates, and exports of foreign affiliates.<sup>1</sup> However, this simplification permits us to avoid complex firm-level decisions in serving foreign markets and to focus on the choice between home and foreign production.

The EKK model is based on the monopolistic competition framework by Melitz (2003). Goods are differentiated and a single firm produces a unique good  $j$  with efficiency  $z_i(j)$ . There are  $N$  countries that have a continuum of potential producers. A firm in home country  $i$  that invest and produce in host country  $n$  will incur unit costs:

$$c_{ni}(j) = \frac{w_n d_{ni}}{z_i(j)} \quad (1)$$

where  $w_n$  is the factor cost in country  $n$  and  $d_{ni}$  is an iceberg form of efficiency loss to implement production technology abroad, including local taxes imposed on production, management costs of local workers, and coordination costs of foreign plants. A firm incurs no additional cost to implement its production technology at home. Since each firm receives a random productivity draw from a Pareto distribution, a measure of potential producers with efficiency of at least  $z$  is:

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<sup>1</sup> Irarrazabal et al. (2012) considers intra-firm trade, but not exports of foreign affiliates.

$$\mu_i^Z(Z \geq z) = T_i z^{-\theta}, \quad z > 0 \quad (2)$$

where  $T_i$  is the average level of efficiency/technology in country  $i$ . The parameter  $\theta$  is a distribution parameter of firm productivities for  $\theta > 0$ .

Each country has the standard CES preferences over differentiated goods with the elasticity of substitution between any two goods  $\sigma > 1$ . These preferences yield a demand function:

$$X_n(j) = \alpha_n(j) \left( \frac{p_n(j)}{P_n} \right)^{-(\sigma-1)} X_n \quad (3)$$

where  $X_n(j)$  is the sales by firm  $j$  in country  $n$ ,  $X_n$  is an aggregate demand for manufacturing varieties, and  $P_n$  is the CES price index. We assume  $\theta - 1 > \sigma$ .  $\alpha_n(j)$  is an unobservable demand shock for firm  $j$  selling in country  $n$ , with higher values indicating a preferable shock. A firm  $j$  enters market  $n$  by paying a fixed cost to establish a production plant:

$$E_{ni}(j) = E_{ni} \varepsilon_n(j) \quad (4)$$

where  $E_{ni}$  is the general fixed cost that is constant for all firms, including land purchase expenses, plant construction costs, and government regulations.  $\varepsilon_n(j)$  is an idiosyncratic fixed cost specific to firm  $j$  entering market  $n$ , with higher values indicating larger investment costs in market entry. In this setting, firm  $j$  from country  $i$  will generate net profits in market  $n$ :

$$\pi_{ni}(j) = \left( 1 - \frac{c_{ni}(j)}{p_n(j)} \right) \alpha_n(j) \left( \frac{p_n(j)}{P_n} \right)^{-(\sigma-1)} X_n - E_{ni} \varepsilon_n(j) \quad (5)$$

With monopolistic competition and Dixit-Stiglitz preferences, each firm maximizes its profit by charging a constant markup  $\bar{m} = \sigma/(\sigma - 1)$  over its unit cost  $c_{ni}(j)$  such that  $p_n(j) = \bar{m}c_{ni}(j)$ . Its total gross profit is proportional to demand with a factor of  $1/\sigma$ , yielding  $X_n(j)/\sigma$ . Firm  $j$  will enter market  $n$  if and only if its operating profit is sufficient to overcome the fixed entry cost:

$$\eta_n(j) \left( \frac{p_n(j)}{P_n} \right)^{-(\sigma-1)} \frac{X_n}{\sigma} \geq E_{ni} \quad (6)$$

where  $\eta_n(j) = \alpha_n(j)/\varepsilon_n(j)$  is an entry shock to firm  $j$  that invests in market  $n$ .

From equation (6), the entry hurdle condition shows that firm  $j$  in country  $i$  enters market  $n$  if and only if its unit cost is less than the threshold entry cost:

$$c_{ni}(j) \leq \bar{c}_{ni}(j) \quad (7)$$

where:

$$\bar{c}_{ni}(j) = \left( \eta_n(j) \frac{X_n}{\sigma E_{ni}} \right)^{1/(\sigma-1)} \frac{P_n}{\bar{m}} \quad (8)$$

Substituting the constant markup price and equation (8) into equation (3), we express the latent sales conditional on entry:

$$X_{ni}(j) = \frac{\alpha_n(j)}{\eta_n(j)} \sigma E_{ni} \left( \frac{\bar{c}_{ni}(j)}{c_n(j)} \right)^{\sigma-1} \quad (9)$$

Equations (7), (8), and (9) provide the main theoretical predictions about the structure of heterogeneous multinational firms. From the entry threshold in (8), a lower value of  $\bar{c}_{ni}(j)$  indicates a less attractive market for multinational production. Conditional on entry, equation (9) dictates the volume of sales by firms in that market. Thus, the model predicts that high productive firms are more likely than low productive firms to: (i) invest in a larger number of markets, (ii) penetrate the less attractive markets, and (iii) yield larger sales per market. Taken together, we predict a hierarchy of market destinations in which firms investing in the  $k + 1$  th popular market should also enter the  $k$  th popular market. However, the presence of entry and demand shocks in the model allows firms with identical productivity to deviate from the identical patterns of market entry and sales volume, suggesting a weak pecking order for the behavior of multinational firms.

## 2.2. Calibration and Validation

To estimate the model, the entry and sales conditions are re-specified. To isolate the heterogeneous component of unit costs, we define standardized unit costs:

$$u(j) = T_i z_i(j)^{-\theta} \quad (10)$$

By connecting the country-level parameters in equation (8) with the total number of firm entries  $N_{ni}$ , we express the entry hurdle:

$$u(j) \leq \bar{u}_{ni}(\eta_n(j)) = N_{ni} \kappa_2^{-1} \eta_n(j)^{\tilde{\theta}} \quad (11)$$

where  $\tilde{\theta} = \theta/(\sigma - 1) > 1$  and  $\kappa_2 = \int \eta^{\tilde{\theta}} g_2(\eta) d\eta$ .  $\bar{u}_{ni}(\cdot)$  is a standardized entry hurdle in market  $n$  for potential producer  $j$  in country  $i$ .  $\tilde{\theta}$  is the heterogeneity in observed sales, with a lower value indicating a larger dispersion in sales across firms. Conditional on entry, the sales condition for firm  $j$  in market  $n$  is rewritten as:

$$X_{ni}(j) = \frac{\alpha_n(j)}{\eta_n(j)} \bar{X}_{ni} \frac{\kappa_2}{\kappa_1} (v_{ni}(j))^{-1/\tilde{\theta}} \quad (12)$$

where  $\bar{X}_{ni}$  is the average sales in market  $n$  of foreign affiliates by multinationals from country  $i$ ,  $\kappa_0 = \tilde{\theta}/(\tilde{\theta} - 1)$ , and  $\kappa_1 = \kappa_0 \iint \alpha_n(j) \eta_n(j)^{(\tilde{\theta}-1)} g(\alpha, \eta) d\alpha d\eta$ . We assume that the parameter  $v_{ni}(j) = u(j)/\bar{u}_{ni}(\eta_n(j))$  follows a uniform distribution on  $[0, 1]$ .

To parameterize  $\kappa_1$  and  $\kappa_2$ ,  $g(\alpha, \eta)$  is assumed to be joint lognormal with zero means, variances ( $\sigma_\alpha$  and  $\sigma_\eta$ ), and correlation  $\rho$ . This assumption allows us to express  $\kappa_1$  and  $\kappa_2$ :

$$\kappa_1 = \left[ \frac{\tilde{\theta}}{\tilde{\theta}-1} \right] \exp \left[ \frac{\sigma_\alpha + 2\rho\sigma_\alpha\sigma_\eta(\tilde{\theta}-1) + \sigma_\eta(\tilde{\theta}-1)^2}{2} \right] \quad (13)$$

$$\kappa_2 = \exp \left[ \frac{(\tilde{\theta}\sigma_\eta)^2}{2} \right] \quad (14)$$

Taken together, the entry and sales conditions are governed by four structural parameters: heterogeneity in observed sales  $\tilde{\theta}$ , variance in sales  $\sigma_\alpha$ , variance in entry shocks  $\sigma_\eta$ , and correlation  $\rho$ . We denote the set of these structural parameters:

$$\Theta = (\tilde{\theta}, \sigma_\alpha, \sigma_\eta, \rho)$$

We estimate a set of optimal structural parameters by calibrating the model to match firm-level data in Japan. Specifically, we use the Basic Survey of Japanese Business Structure and Activities by the Japanese Ministry of Economy, Trade, and Industry (METI), which covers all business firms with 50 employees or more and capital of 30 million yen or more in both manufacturing and non-manufacturing sectors. To link foreign affiliate sales with Japanese parent firms, we also use the Basic Survey of Overseas Business Activities by METI, which covers manufacturing and non-manufacturing firms that are headquartered in Japan and own at least one foreign business enterprise.<sup>2</sup> For data cleaning, we exclude the affiliates that were not operating and/or had no sales information. We primarily use the data on manufacturing firms in 2006 for calibration. Our sample dataset consists of 2,032 parent firms with 7,626 foreign affiliates across 70 markets in 2006. However, some parent firms have missing domestic sales, so that we can not measure a linkage between domestic and foreign sales for them. While including these parent firms does not alter key results significantly, we use the reduced sample of 1,656 parent firms.

For an estimation method, we employ the simulated method of moments (McFadden, 1989). In the first step, we use the entry and sales conditions in equations (11) and (12) to simulate an artificial producer  $s$  by generating its efficiency draw  $u(s)$ , sales shock  $\alpha_n(s)$ , and entry shock  $\eta_n(s)$ . With an initial guess for the structural parameters and aggregate data on Japanese multinationals, we produce a dataset of artificial firms including the market entry and affiliate sales of multinational firms. In the second step, we construct a set of moment conditions from simulated multinationals and actual Japanese multinationals. We define a vector of deviations between actual and artificial moments for outcome  $k$ :

$$y(\Theta) = m^k - \hat{m}^k(\Theta). \quad (15)$$

Following the theoretical implications of the model, we choose four moment conditions: pecking order strings, affiliate sales distributions across markets, parent sales distribution in Japan, and multinational production intensity. Stacking a vector of moment conditions, we minimize the objective function with respect to the structural parameters:

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<sup>2</sup> A foreign business is defined as one in which 10 percent of the affiliate's equity shares are owned by a Japanese parent firm.

$$\hat{\Theta} = \arg \min_{\Theta} \{ [m^k - \hat{m}^k(\Theta)]' [m^k - \hat{m}^k(\Theta)] \}. \quad (16)$$

Table 1 presents the estimation results of the structural parameters with bootstrapped standard errors. To mitigate the influence of noisier segments of the data, we exclude markets with less than 10 foreign affiliates from the estimation. We find that the parameter of size dispersion is 1.99, which is slightly lower than the EKK's estimate of 2.46 for French exporting firms. The estimate of variance in sales and entry shock is 1.64 and 0.34, respectively. These estimates are quite similar in magnitude to the corresponding estimate for French exporters in EKK (2011). The correlation between  $\ln \alpha_n(j)$  and  $\ln(\alpha_n(j)/\varepsilon_n(j))$  is  $-0.62$ . Additionally, we check the robustness of the benchmark estimates by estimating the parameters for all the markets, without the pecking order of entry from the moment conditions, and the data in 1996. These checks demonstrate that the benchmark estimates are robust to alternative specifications of the sample and the moments used for estimation.

=== Table 1 ===

#### *Model Validation*

As our main purpose is to conduct counterfactual analysis based on the credible approach, it is critical whether the calibrated model can be used to replicate real multinational activity reasonably well. To this end, we conduct internal and external validation of the model. Given the estimated parameters, we first simulate a new dataset of multinational activity and compare the simulated moments with the moments from the estimation sample. We find a fairly good fit of the data between simulated and actual moments, suggesting that the model is able to closely replicate the in-sample moments of the actual data. However, the internal validation does not clearly show the predictive power of the model about multinational activity in an environment with a significantly different level of FDI barriers.

We proceed to examine whether the estimated model can be used to simulate multinational activity when FDI barriers change. Specifically, we reproduce out-of-sample predictions of Japanese multinational activities in 2006 with our parameters estimated on the 1996 data. Using the 2006 data to parameterize  $N_{nJ}$  and  $\bar{X}_{nJ}$  with the 1996 parameter estimates, we simulate an artificial set of multinationals from the entry and sales conditions for simulated firm  $s$ :

$$u(s) \leq \bar{u}_n(\eta_n(s)) = N_{nJ}^{2006} \kappa_2^{-1} \eta_n(s)^{\bar{\theta}} \quad (17)$$

$$X_{nJ}(s) = \bar{X}_{nJ}^{2006} \frac{\alpha_n(s) \kappa_2}{\eta_n(s) \kappa_1} \left( \frac{u(s)}{\bar{u}_n(s)} \right)^{-1/\bar{\theta}}. \quad (18)$$

Because FDI barriers were likely to differ significantly between 1996 and 2006, this external validation approach is in the spirit of the “non-random holdout sample” (Keane and Wolpin, 2007). Comparing the number of simulated and the actual number of firms according to the

moment conditions, we find that the model fit is fairly good along various dimensions of multinational activities such as the distribution of foreign affiliate sales across markets, distribution of sales back in Japan, and multinational production intensities. Thus, we conclude that the calibrated model can be used to predict multinational activity when governments in developing countries would implement counterfactual investment liberalization to reduce their investment barriers.

### 2.3. Global General Equilibrium

To conduct counterfactual experiments, we first need to account for adjustments of aggregate prices and wages that take place following an exogenous change in variable and fixed costs of foreign production. Following the approach in EKK (2011), we set up a general equilibrium framework in which producers serve their home country by domestic production and foreign countries through FDI. Each country is endowed with labor, which is mobile within countries, but immobile across countries. Intermediates are a Cobb-Douglas combination of labor and intermediates. Final output is non-traded and a Cobb-Douglas combination of manufactures and labor. Fixed cost for FDI is paid by labor. Profits accrue to the headquarters country of producers. As consumers own equal shares of each firm headquartered in their country, the profits are redistributed equally among the consumers. A country's GDP is equal to its total wage from production in its own country and its total profit from abroad. Lastly, some countries are net receivers for FDI, implying that they incur FDI deficits.

The general equilibrium framework is set up such that manufacturing production and consumption across countries are connected through FDI activity. Equilibrium in the world market for manufacturers leads to a system of equations. Based on the approach of Dekle et al. (2008), we solve for changes in wages and prices from an exogenous change in variable and fixed FDI costs. By solving for prices and wages jointly, we calculate counterfactual changes across countries in the entry number and affiliate sales of Japanese firms,  $\hat{X}_{nJ}^C$  and  $\hat{N}_{nJ}^C$ . Given the counterfactual changes in aggregate sales and entry from Japan to other countries, we calculate the expected changes in the aggregate sales and entry. Then, we use the entry and sales conditions in equations (11) and (12) to specify the corresponding counterfactual conditions:

$$u(s) \leq \bar{u}_{nJ}^C(\eta_n(s)) = N_{nJ}^C \kappa_2^{-1} \eta_n(s)^{\bar{\theta}} \quad (19)$$

$$X_{nJ}^C(s) = \bar{X}_{nJ}^C(s) \frac{\alpha_n(J) \kappa_2}{\eta_n(J) \kappa_1} \left( \frac{u(s)}{\bar{u}_{nJ}^C(s)} \right)^{-1/\bar{\theta}} \quad (20)$$

Holding the structural parameters fixed, we next simulate a set of artificial firms on the basis of equations (19) and (20) to generate a dataset of counterfactual multinational entry and sales. Throughout the counterfactual simulations, we fix productivity draws and entry and sales shocks

specific to individual firms. Thus, all changes in firm-level activity relative to the baseline stem solely from a change in aggregate FDI barriers.

### **3. Discussions on Investment Barriers**

Drawing on the methodological framework in section 2, we can conduct a series of counterfactual experiments under a certain scenario. While simple extreme scenarios are global prohibition and no friction of multinational production, a comparison of these cases does not yield practical policy implications. To make an analysis relevant for policy discussions, we discuss investment barriers for FDI and identify policy-related frictions for multinational activity.

#### **3.1. Policy-related Investment Costs**

To design counterfactual scenarios relevant for policy issues, we first need to identify crucial barriers toward foreign investment. As is well known, foreign firms take into account a wide range of factors in making direct investment, including not only investment costs related to institutional and regulatory barriers, but the market size, factor endowments, transport costs, infrastructure quality, macroeconomic stability, and so on. Empirical evidence for these FDI determinants has been shown in the large number of previous studies (Blonigen, 2005; Barba Navaretti and Venables, 2004). Among alternative determinants, market-seeking and efficiency-seeking motives constitute a fundamental incentive for multinational firms in manufacturing to make direct investment in a foreign market (Markusen, 2004). This suggests that the first-order determinants of FDI would be the potential market size and production costs in a host country. However, these market characteristics improve only in the long term and do not change in the short term. The analysis of these determinants helps us to see policy implications from the long-run perspective, but sheds little light on the plausible policy reforms that can be implemented in the short term.

By contrast to the previous literature, this paper focuses exclusively on institutional and policy-oriented barriers that are specific to foreign investors, but less relevant for domestic investors in the economy. Thus, this approach has less emphasis on overall investment climate in the market that influences investment and production decisions both by domestic firms and by foreign firms. For example, Dollar et al. (2005) define the investment climate as the institutional, policy, and regulatory environment in which firms operate, and investigate the impact of investment climate on firm performance in developing economies. Specifically, they use the World Bank survey to highlight the public services provided by the government for firms: export/import clearance times, the reliability of power supply, telecommunications set-up

times, and so on. As investigated by Kinda (2010), these factors are apparently crucial for multinational activity, and a broad measure of investment barriers is useful for understanding aggregate impacts on multinational production. However, the broad measure of investment impediments is likely to affect both domestic and foreign firms, making it difficult to address what specific factors deter FDI inflows.

By focusing on FDI-specific restrictions, we attempt to make a sharp analysis for the impact of declining investment costs on heterogeneous multinational firms. By FDI-specific restrictions, we mean host country's institutional environment in which parent firms in a foreign country establish their affiliate company. In addition to the general determinants of FDI as previously discussed, multinational parent firms take into account institutional restrictions to foreign investment and investment incentives for foreign investors. Investment barriers for foreign firms would decline when some restrictions on FDI are removed and when some incentives are provided. In this paper, we analyze a removal of policy-related restrictions toward foreign investors in order to get clear policy implications as to what policy reforms are necessary to reduce investment distortions. In this respect, our approach is similar to the prior study by Waglé (2011) on the institutional determinants of FDI, but differs in that we adopt a structural method to investigate the impact of institutional barriers on individual firms. Additionally, Gormsen (2011) estimate the unobservable barriers to FDI from the observed data on FDI stocks. Conceptually, his measure of FDI barriers represents the relative attractiveness of holding foreign capital perceived by a domestic firm as compared with domestic capital. As we focus on more specific FDI barriers than his measure, our analysis would yield specific implications for policy reforms in investment impediments.

### **3.2. Fixed FDI Costs and Investment Procedures**

As discussed in the preceding section, we focus on policy-related investment costs among alternative investment barriers for multinationals. To design a hypothetical scenario consistent with our theoretical model, we further need to connect specific investment barriers to the fixed and variable costs of FDI activity. To this end, we first discuss fixed FDI costs in this section.

Equation (4) of the model shows that individual firms pay fixed costs to start foreign production, and incur additional fixed costs as compared with local firms in a host market. For counterfactual analysis, we need to measure such entry barriers specific to foreign investors. In this respect, the World Bank's *Investing Across Borders* (IAB) project provides useful quantitative measures of FDI barriers. The IAB survey provides comparable indicators across countries for (1) foreign ownership restrictions across sectors, (2) starting a foreign business, (3)

accessing industrial land, and (4) arbitrating commercial disputes.<sup>3</sup> The survey data were obtained from over 2,350 local experts and practitioners in 87 economies between April and December 2009.

Because we focus exclusively on manufacturing multinational firms, an indicator for ownership restrictions in manufacturing seems to be a good candidate for analysis. However, the index exhibits little variation across economies whereas there is relatively larger variation in non-manufacturing sectors such as transportation, electricity, and telecommunications. We interpret these results as suggesting that manufacturing foreign firms are generally allowed to establish their own foreign subsidiary and acquire domestically-owned firms. Thus, we conclude that ownership restrictions are not likely to be a significant barrier for manufacturing multinationals. Alternatively, an obvious entry barrier pertains to an establishment process of a foreign subsidiary by multinational firms. It is useful to employ an indicator on starting a foreign business.<sup>4</sup> According to the IAB report, foreign companies need 14 more days and 2 more procedures on average than domestic companies do. Specifically, we use the number of procedure days for foreign firms to quantitatively assess the impact on multinational activities of improving equal treatment between domestic and foreign investors, simplifying establishment procedures for foreign firms, and streamlining approval of foreign investment.

To link a specific measure of FDI regulation with fixed FDI costs,  $E_{ni}$ , we use the following equation from the modified version of the EKK model:

$$\sigma E_{ni} = \kappa_2 \kappa_1^{-1} \bar{X}_{ni} \quad (21)$$

Taking logs and rearranging the above equation, we have the log of average affiliate sales by multinationals from home country  $i$  in host country  $n$  as a function of  $\ln E_{ni}$  and other parameters. We then assume that  $\ln E_{ni}$  depends on the number of procedure days for foreign investors,  $Day$ , with an error term:

$$\ln E_{ni} = \mu_0 + \mu_1 Day_n + \varepsilon_{ni} \quad (22)$$

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<sup>3</sup> Accessing industrial land focuses on laws and regulations toward foreign investors, which in part aim for protections of domestic citizens and environments. On the other hand, arbitrating commercial disputes measure legal regimes for commercial disputes, which in part represent the ease of arbitration process for both domestic and foreign companies. These indicators are not specific to the barriers faced by foreign investors.

<sup>4</sup> According to the IAB report, procedural steps include pre- and post-incorporation procedures that are officially required for a foreign investor to formally establish a wholly-owned subsidiary. For instance, the ease of establishing a company depends on restrictions to the composition of the board of directors or appointment of managers, required use of a local third party in the establishment process, (3) possibility to expedite establishment procedures through an official channel, (4) requirement of an investment approval, (5) limitations of the business registration process, (6) restrictions on holding a foreign currency commercial bank account, (7) minimum capital requirements, and (8) availability of electronic services related to establishing and operating a business.

Using the equations (21) and (22), we specify the log of  $\bar{X}_{ni}$  as a function of days:

$$\ln \bar{X}_{ni} = \mu_0 + \mu_1 Day_n + \gamma Z' + \varepsilon_{ni} \quad (23)$$

where  $Z$  is a set of control variables, including GDP, GDP per capita, distance, geographic contiguity, common language, regional trade agreements, and home-country fixed effects. By estimating the above specification, we can infer a relationship between the procedure days and fixed costs of FDI.

For estimation, we construct data on average affiliate sales using the number of foreign affiliates and their sales across home and host countries as reported in the OECD *Globalisation Database*. To supplement the data on average affiliate sales, we also use data from the U.S. BEA and Japanese RIETI. Data on the control variables come from the CEPII Gravity Dataset compiled by Head et al. (2010). After constructing the dataset, our sample consists of 212 observations. The variable of procedure days in the sample has the mean of 39.2 and the standard deviation of 37.1, ranging from 6 days up to 179 days. Based on the sample, we estimate the specification (23) by an ordinary-least-squares estimation. We find that the coefficient of  $Day$  is 0.0031 with the robust standard error of 0.0018, implying that the length of investment procedures in a host market has the significantly positive association with the average sales of foreign affiliates. Using the estimated coefficient, we compute the elasticity of  $E_{ni}$  with respect to a change in the procedure days. For example, a fall in the procedure length by 10 days should lead to a decline in fixed FDI costs by 3.15% ( $=100 \times [(\exp(0.0031 \times 10) - 1)]$ ). In the following counterfactual scenarios, we compute the corresponding percentage change for each country.

### 3.3. Variable FDI Costs and Foreign Tax Rates

We turn to examine variable FDI costs. According to the model, individual firms incur variable costs in the iceberg form of efficiency loss from operating their plant in a foreign market, which increase their unit cost of offshore production. Among alternative factors to determine the efficiency loss, taxation on FDI is apparently policy-related impediments for the efficient management of local production by multinationals. As governments in developing economies impose a variety of taxes, a reduction of foreign tax rates is a useful policy experiment to investigate the impact of investment liberalization on multinational production.

To examine a tax policy in developing countries, we first construct effective taxes imposed on foreign firms. Following Burnstein and Monge-Naranjo (2009), we use the data on U.S. multinational companies from the U.S. BEA to compute an effective tax rate applied to foreign affiliates by U.S. multinationals across host countries. As is explained in Desai et al. (2004), the taxes levied on multinationals include not only corporate income taxes, but indirect foreign

taxes including sales taxes, value-added taxes, and property taxes. To capture the overall effective tax rates in each host country, the foreign tax rate is calculated as:

$$Tax = \frac{\text{foreign income taxes + indirect foreign tax}}{\text{net foreign income + foreign income taxes + indirect foreign tax}} \quad (24)$$

In the following analysis, we assume that the effective tax rates of U.S. multinationals also apply to the multinationals originating from other home countries.<sup>5</sup>

To relate foreign tax rates with variable FDI barriers,  $d_{ni}$ , we use the following equation from the model:

$$\frac{X_{ni}}{X_n} = \frac{T_i(w_n d_{ni})^{-\theta} (c)^\theta}{\Phi_n} \quad (25)$$

where  $c$  and  $\Phi_n$  are parameters. Taking logs and rearranging the equation, we specify the log of  $X_{ni}$  as a function of variable FDI costs  $d_{ni}$  and other variables. We assume that the log of variable costs for affiliate sales in host country  $n$  by multinationals from home country  $i$  is a function of the foreign tax rates with an error term:

$$\ln d_{ni} = \lambda_0 + \lambda_1 Tax_n + u_{ni} \quad (26)$$

The coefficient of  $Tax$ ,  $\lambda_1$ , is needed to quantify a percentage change in variable FDI cost from decreasing foreign tax rates. However, the above equation is not estimable for the lack of observed data on variable FDI costs. To obtain the estimate for the tax variable, we re-specify the relationship between  $X_{ni}$  and  $d_{ni}$  as:

$$\ln X_{ni} = \lambda_0 - \theta \lambda_1 Tax_{ni} + \psi Z' + u_{ni} \quad (27)$$

where  $Z$  is a set of control variables, including GDP, GDP per capita, distance, geographic contiguity, common language, colonial relationships, legal origins, GATT/WTO membership, regional trade agreements, and home-country fixed effects.<sup>6</sup>

For estimation, we construct the sample with 2,402 observations using the estimated data on affiliate sales in 2006 from the Japanese RIETI and UNCTAD, which are also used in the global general equilibrium analysis.<sup>7</sup> The effective foreign tax rate has the mean of 0.40 and the

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<sup>5</sup> Since some developing countries are not included in the BEA data, we replace missing figures with either regional effective foreign taxes, or nearest neighbor tax rates from the same data. These countries include Indonesia, Laos, Myanmar, Pakistan, Turkey, and Vietnam in the following analysis.

<sup>6</sup> Additional control variables from the CEPII Gravity Dataset are included for the larger sample size when bilateral affiliate sales are used as the dependent variable.

<sup>7</sup> We use the UNCTAD data on FDI stocks and flows for the period 1990-2006 to estimate foreign affiliate sales in 2006. First, we construct bilateral FDI stocks in 2006 for each country pair, and approximate missing figures by the cumulative stocks of FDI flows over 1990-2006. Negative figures of the estimated FDI stocks are replaced with zero. Second, we estimate total FDI stocks in manufacturing sectors by multiplying the figures by 21%; it is an average share of manufacturing FDI as reported in the World Investment Report (2010). Finally, we multiply the FDI stocks by 2.02

standard deviation of 0.17, ranging from 0.02 to 0.70. Based on the sample, we estimate the coefficient of  $Tax$  by the OLS method. The OLS estimate is -1.02 with a robust standard error of 0.30, which is statistically significant at the 1% level. Consistent with our intuition, foreign affiliate sales are systematically lower in the countries with higher effective tax rates. To further obtain an estimate for  $\lambda_1$ , we need to calculate  $\lambda_1 = 1.02/\theta$ . Using the estimate for an elasticity of substitution from Kang (2008) and the estimated size dispersion of Japanese multinationals, we obtain 2.37 for  $\theta$  ( $= \tilde{\theta}(\sigma - 1) = 1.99(2.19 - 1)$ ). This implies that the elasticity of variable FDI costs with respect to the foreign tax rate,  $\lambda_1$ , is 0.43 ( $=1.02/2.37$ ). For instance, a 10% point increase in the foreign tax rate is associated with an increase in the variable FDI costs by 4.39% ( $= 100 \times [(\exp(0.43 \times 0.10) - 1)]$ ). In the following analysis, we calculate the corresponding percentage drop in variable FDI barriers for each country.

### **3.4. Counterfactual Scenarios**

We consider the four scenarios of counterfactual policy experiments as summarized in Table 2. We set up the policy experiment (1) to reduce barriers for foreign firms in developing economies to the level of their domestic firms, and (2) to eliminate impediments for the foreign firms to the level of developed economies. We assume that these experiments are applied to either fixed or variable costs of foreign production by multinational firms. A specific change in these costs is computed using the elasticity of fixed and variable FDI costs with respect to investment procedure days and effective foreign tax rates, respectively. Throughout counterfactual experiments, we maintain production barriers within a country constant. In the following, we will explain details of each experiment.

=== Table 2 ===

We consider the policy experiments in which governments in developing economies reduce the length of investment procedures for foreign investors. We assume that the governments reduce the approval days for foreign firms to the level that applies to domestic firms in their economies, which can be called the “level-playing-field” policy. As is explained previously, we use the actual approval days for foreign firms from the Investing-Across-Borders (IAB) of the World Bank. For a comparable measure of business restrictions on domestic firms, we employ the days of starting a business from the Doing Business Indicator (DBI) of the World Bank.<sup>8</sup> We subtract the IAB figures from the DBI figures to measure the magnitude of reductions in

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to convert into sales by foreign affiliates; it is the estimated relationship between FDI stocks and affiliate sales in the World Investment Report (2010).

<sup>8</sup> The data are available at the website: <http://www.doingbusiness.org/>. We estimate the FDI procedure days for Laos from a simple regression of the IAB measures on the DBI measures.

FDI-specific barriers in developing countries. As the DBI measure exceeds the IAB measure for Bangladesh, Malaysia, and Peru, we assume that these countries do not reduce the FDI-specific barriers. Thus, we compute the length of eliminating procedure days for multinationals, which the governments in developing economies must target to implement the “level-playing-field” policy. Drawing on the estimated elasticity in section 3.2., we compute the corresponding percentage change in fixed FDI costs for each country in Table 3.

=== Table 3 ===

For the second policy experiment, we consider that governments in developing economies aim for the higher level of investment liberalization by eliminating the FDI procedure days to the level of developed economies, which we call the “catching-up” policy. In this experiment, we assume that the developing economies eliminate the length of procedure days for foreign investors to the corresponding level of developed economies. According to the IAB report, foreign firms take on 20 days on average for their investment approval in the developed countries, which we take as the catch-up target for developing economies. Thus, we subtract the IAB figures from 20 days to calculate the amount of procedure elimination necessary to eliminate FDI-specific barriers. As is the case of the first scenario, we replace no change for the economies in which the IAB measures are smaller than 20. Finally, the corresponding percentage change in fixed FDI costs is also list in Table 3.

We turn to examine variable FDI costs in the third scenario, where governments in developing economies reduce effective tax rates for foreign firms to the level of their domestic firms. For the effective tax rate applied to domestic firms, we follow Burstein and Monge-Naranjo (2009) to set it at 0.29, which is the average effective tax rate relevant for investment decisions. We subtract the effective tax rate of U.S. multinationals from the average effect tax rate to compute the amount of tax reductions for the level-playing-field policy. Since the tax rate for foreign firms is lower in China and Malaysia, we replace zeros for these countries. We calculate the corresponding percentage change in variable FDI costs as shown in Table 3.

Finally, the fourth policy experiment is to reduce the effective tax rate of foreign firms to the level of developed economies. From our data on the tax rates, the average effective tax applied to U.S. multinationals in developed economies is 32.5. Thus, the effective tax rate for foreign firms is reduced to the tax rate of 32.5, which is slightly more moderate policy target relative to the third experiment. We replace zeros for the countries in which the tax rate of FDI is lower than 32.5, including China, India, and Malaysia. The corresponding percentage change in variable FDI costs is shown in Table 3.

#### **4. Counterfactual Results**

We proceed to quantify the aggregate and firm-level consequences of eliminating barriers to multinational production in developing economies. Conducting a series of counterfactual simulations, we discuss the quantitative implications of counterfactual changes from the benchmark simulation that replicates the 2006 data.

##### **4.1. Welfare and Aggregate Multinational Production**

Table 4.1 presents the general equilibrium changes in real wages across developing economies resulting from their investment liberalization. For each experiment, we compute a proportion of nominal price changes relative to nominal wage changes in order to estimate the aggregate welfare impacts. We find that the real wages increase for some developing economies and decline for others. For instance, the economies such as the Philippines, South Africa, and Vietnam experience a welfare gain across different policy experiments. These economies are commonly distinctive in that their policy-related barriers are relatively high, translating into the relatively large reduction of fixed and variable FDI costs. Because there is a large inflow of foreign multinational firms to these markets, foreign firms increase demand for local labor, which in turn pushes up nominal wages. At the same time, more efficient multinational firms drive out less efficient local firms to produce at lower marginal costs, leading to a steep decline in price levels. These forces combine to generate a relatively large increase in real wages for these countries.

==== Table 4 ====

By contrast, the economies such as Chile, Malaysia, and Mexico are already open to foreign investors, and their reduction of policy-related investment barriers is relatively negligible in the policy experiments. This implies that these markets become less attractive for multinational firms compared with the other developing economies that eliminate substantially FDI barriers. As a result, the counterfactual wages relative to baseline wages do not increase sufficiently as compared with the counterfactual prices relative to baseline prices. This would lead to a modest loss of welfare for these countries, as shown in Table 4.1. Additionally, the average reduction of fixed FDI costs is larger in scenario (2) than in scenario (1), and we find that the former experiment shows a generally larger welfare gains across economies. Also, the average decline of variable FDI costs is greater in scenario (3) than in scenario (4), with the former having the slightly larger welfare gains on average. These results suggest that welfare gains for investment liberalization in developing economies are likely to increase for more significant policy reforms in investment barriers.

Following the general equilibrium changes in wages and prices, we compute aggregate

changes in entry and sales by Japanese firms across markets. By focusing on foreign affiliates in developing economies, we present the baseline and counterfactual changes in Table 5. In the baseline, there is total firm entry of 5,414 to developing countries, with 258 entries per market on average. Total affiliate sales in these markets amount to 36.6 trillion yen, with the average sales per market of 1.74 trillion yen. Across the policy experiments, the counterfactual increase in firm entry is the largest for scenario (2); when governments in developing economies reduce investment procedure days to the level of developed economies, there will be 1,181 additional firm entries from Japan. By contrast, the counterfactual increase in firm entry is 501 in scenario (3) and 486 in scenario (4) for a reduction of effective tax rates on foreign firms in developing economies. These changes are comparable to the result in scenario (1) for a modest elimination of investment procedures. In terms of the average firm entry per market, the counterfactual increase of Japanese firm entries is the largest for substantial reductions of fixed costs in scenario (2).

=== Table 5 ===

We find that total affiliate sales increase substantially for a large reduction of investment procedure length in the policy experiment (2). On average, developing economies would experience an increase of 0.2 trillion yen in foreign affiliate sales. In contrast, the aggregate affiliate sales increase much less in the policy scenarios (1) mainly for less drastic reforms in the investment procedures. In contrast, the average affiliate sales in developing countries increase by 0.12 and 0.10 trillion yen in scenarios (3) and (4). These increases are larger than the modest reform on fixed costs in scenario (1), but smaller than the substantial reform in scenario (4). Taken together, these results suggest that significant policy reforms in investment procedures could be more effective than the provision of fiscal incentives for foreign firms to attract foreign investment and promote their local production.

#### **4.2. Firm-level Impacts on Multinational Production**

Having analyzed the aggregate impacts, we proceed to shed light on firm heterogeneity in the counterfactual results. Specifically, we decompose the aggregate changes in multinational activity into firm-level changes at the extensive and intensive margin. First, we aggregate all the entries to developing countries across initial productivity groups in the baseline. Table 6 shows the extensive margin of the baseline and counterfactual changes from the baseline. The baseline shows that more productive firms establish foreign production in developing economies more than less productive firms do, as is consistent with the findings in Yeaple (2009); more productive U.S. multinationals tend to penetrate less attractive foreign markets. In particular, the top 30% percentiles of firms account for 86.9% of the total entries whereas the bottom 30%

group explains only 2.5%. Thus, the highest productivity groups of firms are crucial foreign investors for developing economies.

=== Table 6 ===

Dissecting the aggregate changes at the extensive margin in counterfactuals, we find strikingly distinctive patterns across productivity groups. Across scenarios (1) to (4), firms in the lowest productivity group close down their foreign affiliates whereas those in the middle and high productivity group increase their entries at an increasing rate in terms of the productivity level. As compared with the firms in the lower middle productivity, those in the upper middle productivity tend to establish new foreign affiliates more prominently in developing economies in the wake of policy reforms in investment procedures and tax rates. However, the exception is the top 1% firms that have already served multiple markets and experience a nontrivial decline in foreign entries in scenario (1). An explanation is that among potential producers below the cutoff productivity, relatively high productive firms tend to overcome entry barriers in a wide range of markets in the wake of policy reforms to reduce entry costs. Some foreign markets experience an entry of relatively productive producers, which would intensify market competition. Thus, a decline in the price index forces the most productive firms to close down some of their foreign affiliates.

Table 7 presents the baseline and counterfactual changes from the baseline regarding the intensive margin of foreign affiliates in developing economies. It is evident from the baseline that more productive firms exhibit larger foreign production per their foreign affiliate. The average volume of local production is remarkably pronounced for the 1% firms; for instance, their average production is around 22 billion yen, which is over 100 times larger than that of the bottom 10% firms and over 10 times greater than that of the top 80-90% firms. These patterns suggest that highest productive firms could account for the majority of local production by foreign firms in developing economies.

=== Table 7 ===

Columns (1) to (4) in Table 7 show the counterfactual changes at the intensive margin from the baseline. In policy experiments (1) and (2), the intensive margin increases for all the firms but the top 1% group. This implies that low and middle productive firms are likely to benefit from an improvement of inefficient processes of investment approval. On the other hand, the most productive firms face increased competition from the entry of other foreign firms, thereby competition effects may shrink offshore production of the multinationals that have already penetrated many foreign markets prior to investment liberalization. Among the groups, the firms in the 60-70 percentiles appear to expand their average local production most significantly. Additionally, the results in policy experiments (3) and (4) generally suggest the similar changes

across different productivity groups. A distinction is a substantial increase in the average local production for the largest 1% firms. Since a counterfactual reduction in effective tax rates mainly reduce operational costs of local production, the largest firms that have already paid initial fixed entry costs may benefit significantly from the tax reductions.

## **5. Conclusion**

Governments in developing economies have recently made substantial efforts to attract foreign investment by investment liberalization and the provision of investment incentives. Prior empirical studies have investigated the impact of eliminating investment barriers on FDI activity, but have paid little attention on how individual firms would respond to an aggregate reduction of investment costs. In this paper, we employ a structural approach to simulate the firm-level responses of multinational production to a series of counterfactual policy changes. To design a practical policy experiment, we link the theoretical measures of variable and fixed costs of multinational production with actual survey measures of investment procedures and effective tax rates faced by multinationals. Compared with the prior literature, our counterfactual analysis would yield policy implications for the more practical level of policy reforms toward foreign investors.

Counterfactual reductions in investment barriers produce a set of interesting changes in welfare and multinational production. The developing economies tend to experience a larger welfare gain for a greater elimination of investment costs because entries of foreign multinationals increase demand for local labor and intensify market competition in host markets. These forces combine to magnify an increase in real wages. However, the other developing countries that implement little policy reforms may experience a welfare loss because their markets are likely to become less attractive for foreign multinationals. As these simulations are based on the assumptions that abstract away from the real world along the various aspects for tractability, these results must be carefully interpreted. Nevertheless, our result is in a sense consistent with the simulation study in Baldwin et al. (1996) on investment creation and diversion effects of the European Single Market Programme.

Our work demonstrates that firm heterogeneity is a crucial point of policy considerations for governments in developing economies to design their investment liberalization strategy. We find that counterfactual changes at the extensive and intensive margin are strikingly different across individual firms. While the level of eliminating investment barriers is uniform for all the firms, more productive firms are more likely than less productive firms to make direct investment and expand local production in developing economies. In terms of the extensive margin, a policy reform in initial investment procedures appears to be more effective than in tax

reductions for attracting new direct investment. On the other hand, the tax reductions for foreign investors tend to magnify the intensive margin by the larger multinationals that have already penetrated multiple markets. These results suggest implications for the potential importance of targeting in the provision of investment incentives because not all the foreign firms would respond to the new investment opportunity.

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**Table 1. Parameter estimates**

Parameter	Estimate	Std. Error
$\tilde{\theta}$	1.99	(0.43)
$\sigma_a$	1.64	(0.07)
$\sigma_\eta$	0.39	(0.31)
$\rho$	-0.62	(0.34)

*Note:* standard errors are computed for the initial fixed parameter estimates using bootstrapping of sampling with replacement by 1000 repetitions.

**Table 2. Summary of Counterfactual Policy Experiments**

Policy Scenario	Fixed Cost	Variable Cost
(1)	To reduce approval days for foreign firms in developing economies to the level of their domestic firms	Constant
(2)	To reduce approval days for foreign firms in developing economies to the level of developed economies	Constant
(3)	Constant	To reduce effective tax rate for foreign firms in developing economies to the level of their domestic firms
(4)	Constant	To reduce effective tax rate for foreign firms in developing economies to the level of developed economies

**Table 3. Hypothetical Reductions in FDI Barriers under Alternative Experiments**

Economy	Income Group	(1)	(2)	(3)	(4)
		Reduction in Fixed Cost		Reduction in Variable Cost	
Argentina	Upper middle	6.07	9.75	15.60	13.87
Brazil	Upper middle	4.44	57.24	11.21	9.55
Chile	Upper middle	0.62	2.83	2.45	0.91
Malaysia	Upper middle	0.00	0.00	0.00	0.00
Mexico	Upper middle	0.93	3.47	3.37	1.83
Peru	Upper middle	0.00	7.39	4.46	2.90
Russian Federation	Upper middle	0.31	3.47	6.39	4.80
South Africa	Upper middle	14.26	14.97	14.41	12.70
Turkey	Upper middle	0.62	0.00	13.78	12.08
China	Lower middle	19.70	27.75	0.00	0.00
Egypt	Lower middle	0.31	0.00	7.36	5.76
India	Lower middle	5.09	8.39	1.43	0.00
Indonesia	Lower middle	3.15	22.70	1.56	0.04
Pakistan	Lower middle	0.00	0.31	1.56	0.04
Philippines	Lower middle	8.73	20.44	7.91	6.29
Thailand	Lower middle	0.31	4.44	10.61	8.96
Vietnam	Lower middle	14.61	25.78	11.36	9.69
Bangladesh	Low	0.00	11.46	1.56	0.04
Cambodia	Low	0.31	22.70	11.36	9.69
Laos	Low	6.76	36.81	11.36	9.69
Myanmar	Low	0.00	0.00	0.00	0.00
Average		4.11	13.33	6.56	5.18

*Notes:* figures indicate a percentage point change in fixed costs for (1) and (2) and in variable costs for (3) and (4); income group is based on the World Bank list of economies as of September 2010; income levels are \$995 or less for low income, \$996–3,945 for lower middle income, and \$3,946–12,195 for upper middle income.

**Table 4. Real Wage Changes in Developing Economies**

Economy	(1)	(2)	(3)	(4)
Argentina	0.995	1.001	1.054	1.046
Brazil	0.998	1.048	1.021	1.017
Chile	0.959	0.966	0.976	0.965
Malaysia	0.953	0.953	0.953	0.953
Mexico	0.987	0.991	0.996	0.992
Peru	0.984	0.993	0.997	0.993
Russian Federation	0.987	0.988	0.990	0.989
South Africa	1.009	1.010	1.040	1.034
Turkey	0.994	0.993	1.034	1.029
China	1.011	1.036	0.954	0.952
Egypt	0.984	0.984	1.001	0.997
India	0.996	0.997	0.995	0.994
Indonesia	0.972	0.989	0.973	0.969
Pakistan	0.995	0.995	0.998	0.995
Philippines	1.006	1.026	1.025	1.018
Thailand	0.960	0.974	1.055	1.039
Vietnam	1.011	1.047	1.058	1.044
Bangladesh	0.995	1.000	0.996	0.995
Cambodia	0.991	1.059	1.080	1.066
Laos	0.999	1.022	1.016	1.013
Myanmar	0.994	0.994	0.994	0.994
Average	0.990	1.003	1.010	1.004

**Table 5. Total Firm Entry and Affiliate Sales in Developing Economies**

	Baseline	(1)	(2)	(3)	(4)
		Counterfactual Change from Baseline			
Total firm entry	5,414	449	1181	501	486
Mean of total firm entry per market	258	21	56	24	23
Total affiliate sales	36.6	0.70	4.10	2.40	2.00
Mean of total affiliate sales per market	1.74	0.04	0.20	0.12	0.10

*Note:* Affiliate sales are in trillions of yen.

**Table 6. Extensive Margin of Foreign Affiliates in Developing Economies**

Initial Productivity Group (percentile)	Baseline	(1)	(2)	(3)	(4)
		Counterfactual Change from Baseline			
0-10	33	-18	-15	-18	-16
10-20	45	-5	2	-6	-7
20-30	58	34	24	27	27
30-40	78	32	62	37	37
40-50	108	45	73	43	44
50-60	149	58	96	64	62
60-70	240	69	128	78	68
70-80	405	84	163	92	87
80-90	831	88	198	105	97
90-99	2433	87	429	69	89
99-100	1034	-26	21	10	-1

**Table 7. Intensive Margin of Foreign Affiliates in Developing Economies**

Initial Productivity Group (percentile)	Baseline	(1)	(2)	(3)	(4)
		Counterfactual Change from Baseline			
0-10	161.2	81.7	115.5	126.4	97.8
10-20	211.2	128.9	127.8	58.6	78.2
20-30	245.0	75.6	109.5	48.8	51.8
30-40	265.4	74.3	153.2	108.5	67.2
40-50	352.2	65.3	123.2	79.5	74.3
50-60	414.5	114.0	134.9	143.3	122.8
60-70	525.4	181.9	212.6	178.1	220.6
70-80	825.1	194.6	285.3	232.7	187.4
80-90	1472.2	322.2	371.9	276.3	349.1
90-99	4785.4	96.2	214.6	109.3	192.8
99-100	22320.3	-92.1	-236.4	777.7	268.1

*Note:* Intensive margin is in millions of yen.