Country image, FDI and Welfare*

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Abstract

Based on a multi-country general equilibrium model of trade and FDI, this paper estimates the effects of host country image on bilateral FDI and welfare. We use a unique dataset from the BBC World Service Poll, which surveys the populations of many countries on their views of whether an evaluated country is having a mainly positive or negative influence in the world, to construct country image proxy variables. We estimate the effects of country image perceptions on the investor profits expectation parameter, and we apply it in two important counterfactual analysis: the Bush effects and the China rising effects. First, the results of the econometric model find that a good country image promotes FDI. A 1% increase in the country image (positive response ratio) is associated with an increase of 1.955% in logarithmic FDI stocks. Second, several robustness test, IV estimations and dynamic panel estimations all have proved this promoting effects. Third, counterfactual analysis indicate that the drop of country image during 2007-2011 incurs the U.S. 0.052%-0.064% loss of total welfare, which cost the country 1.924%-2.339% of its total gains from openness. In contrast, the consistent improvement of China's country image between 2009 and 2012 has amounted to more than 0.878%-1.174% of its total welfare gains from openness.

*All errors are my own.

1 Introduction

Country image (or nation brand) is a comprehensive exhibition of a country's political, economic, social, and cultural elements and is a manifestation of international identity and trust. According to the identity theory (Nye Jr, 2004), a positive country image manifests as a reliable national soft power, making the country more attractive and trustworthy. Country image perceptions can essentially be seen as an informative signal about the true qualities of a country along the respective dimension. For multinationals, the most prominent players in international trade and foreign direct investment (FDI), host (destination) country image should be important when choosing a production location because the positive host country image helps to reduce the risk of globalization strategy and increase the expected profits.[1] Ceteris paribus, multinationals should choose as their production location the country where global consumers show a positive perception of to entry other potential markets through this country. Research on the effect of the country image on trade has been part of international marketing research for decades. A wide range of empirical evidence supports the impact of the origin country image on consumer perception and buyer behaviour, which is called the "country-of-origin" effect (Obermiller and Spangenberg, 1989; De Nisco et al., 2016; Chang, Fujii and Jin, 2022). However, during FDI negotiation, we argue that the FDI decision and the level of FDI are likely to be affected by the investor's trust towards the host country in the possibility of realizing a large return.

The promoting effects of a positive host country image on the source (origin) country's FDI choice is explicit along the respective dimension. First, in the political dimension, a higher host country image means relatively lower political risk and uncertainty perceived by multinationals, which reduces the possibility of FDI losses arising from political changes, geopolitical conflicts, local wars, and terrorist threats in the host country. Second, in the economic dimension, a higher host country image mainly refers to higher institutional quality. A regulated market operation system helps reduce the cost of FDI caused by problems such as rent-seeking and corruption. Conversely, institutional weaknesses often lead to poor quality of public goods provided by the government (e.g., judicial system, government efficiency, regulation, etc.), thus deteriorating the expected returns on FDI. Third, in the social dimension, positive perceptions about the labor characteristic in the host country, including employees' attitudes, abilities, and skills, are a determining factor for FDI decisions. Multinationals would expect better operation profits and enhance investments if locally trained and situated people could cover their employment needs. Fourth, in the cultural dimension,

[1]In this paper, "source country", "origin" and "exporter" have the same theoretical meaning, while "host country", "destination" and "importer" have the same theoretical meaning.

cultural distance not only leads to differences in formal systems but also shapes national differences in values, worldviews, mindsets, and behaviors, leading to higher bilateral coordination costs. Siegel, Licht and Schwartz (2013) find that increased cultural differences increase the cost of doing business for multinational firms and thus discourage their entry. A higher host country image perceived by the source country means a better degree of bilateral cultural identity, which promotes FDI by reducing communication or coordination costs. If trust reduces such monitoring and coordination costs, it may increase the probability of observing international partnerships with local coinvestors (Bloom, Sadun and Van Reenen, 2012).

In this paper, we attempt to measure the gains from FDI by allowing shifts in country-pair level perceptions of country image. We introduce the country image perception into a quantitative trade and multinational production (MP) model built by Arkolakis et al. (2018), which allows multinationals to invest and produce abroad. In the model, multinationals can use the host country as an export platform to sell their creation of differentiated goods ("innovation") to monopolistically competitive markets with differing fixed entry costs and variable trade costs. Because FDI revenues can be repatriated to innovating countries (i.e., the source country of multinationals) to offset innovation costs, this model permits some countries to specialize in innovation and others in production (Wang, 2021). In our model, the image of the host country influences the expected profits of source countries selecting that host country for investment and production, hence influencing FDI to the host country. In addition, changes in country image affect potential FDI entry costs, prompting host countries to specialize in production or innovation through the home market effect (HME) mentioned by Arkolakis et al. (2018).[2] If the host country encounters a decrease in country image, then its total welfare depends on the interaction of two channels: the effect of less exposure to foreign technology and the effect of domestic specialization in innovation.

In econometric analysis, we exploit a unique dataset, the BBC World Service Poll (WSP), to estimate the impact of country image on profits expectation of the source country towards the host country and the implied impacts on FDI. Chang, Fujii and Jin (2022) used this dataset to study the impact of buyer preference on trade flows exhaustively. However, to our knowledge, this is the first paper to quantify the welfare impacts of changes in a country image on worldwide FDI. In quantitative analysis, we calibrate our model to match actual bilateral FDI and trade data across 55 countries or economies. Further, we implement two counterfactual analyses of significant shifts in the country image, given the estimated impact

[2] Other things equal, firms tend to create differentiated goods (innovate) in a country that has low barriers to outward FDI but high barriers to inward FDI. A decrease in a country image raises the cost of attracting foreign direct investment, hence encouraging the entry of indigenous firms and fostering innovation.

of country image on profits expectation and FDI. The one is the *Bush effects* in which we compute the welfare effects for the U.S. in 2011 if the views of its potential investors were to drop to the lower level in 2007. The other one is the *China rising effects* in which we compute the welfare effects for China in 2009 if the views of its potential investors were to jump to a higher level in 2012. Our results indicate that the *Bush effects* incur the U.S. 0.052%-0.064% loss of total welfare, which cost the country 1.924%-2.339% of its total gains from openness. In contrast, the *China rising effects* bring China 0.014%-0.019% gains of total welfare or 0.878%-1.174% of its total gains from openness.

This paper is organized as follows. We provide the related literature in section 2. In section 3, we introduce the theoretical model and the econometric gravity equation used in estimation. In section 4, we first introduce detailed information on the country image proxy variable and trade and FDI data source. Then, we demonstrate the method to calibrate the model and calibration results. Next, section 5 shows our main econometric estimation about partial effects of country image on the profits expectation factor and FDI stocks. In section 6, we carry out two counterfactual experiments based on the estimation obtained by section 5. Finally, section 7 concludes.

2 Literature review

This paper is most closely related to several strands in the literature. First, The model we used is closely related to recent literature on trade and multinational production (MP) such as Ramondo and Rodríguez-Clare (2013), Tintelnot (2017), and Arkolakis et al. (2018). These papers all build a probabilistic representation of multi-country productivity and characterize multinationals' choice of production sites. Tintelnot (2017) and Arkolakis et al. (2018) allow for export-platform MP in their general equilibrium model, while Ramondo and Rodríguez-Clare (2013) combines horizontal and vertical FDI by allowing multinationals use imported inputs from their home country in foreign affiliate production, i.e., intra-firm imports.[3] Except for it includes endogenous innovation choice in the model, We mainly refer to Arkolakis et al. (2018) because the decomposition of welfare is explicit, and we can get analytical gravity equations for aggregate trade flows and FDI stocks.

Second, the model in this paper relates to the prevalent gravity model of trade and FDI. Markusen and Maskus (2002) argues that the trade gravity model built by Anderson and

[3]Firms can decide to export a product it produces domestically, or they can instead decide to produce the same product within the foreign market it wants to serve. Producing in a foreign market at the same value chain stage as the home market is commonly referred to as horizontal FDI. Additionally, firms can decide to disperse different stages of the value chain to multiple countries, including the home market, for eventual export.

Van Wincoop (2003) can conform to the model of investment flows. Based on Markusen and Venables (2000) and Markusen (1997), they synthesize a technology-based general equilibrium model combining horizontal motivations for FDI with vertical motivations. Bergstrand and Egger (2007) add physical capital and third-country effects to Markusens knowledge-capital model and provide a foundation for estimating gravity-like equations of FDI to explain the complementarity of FDI, foreign affiliate sales, and trade to changes in gravity variables. Head and Ries (2008) use a inspection game model of mergers and acquisitions (M&A) in which parent companies have incomplete information on potential acquisitions in host countries and monitoring costs increase as function of distance. By assuming that aquisitions return takes Gumbel distribution, they develop a model of FDI as a market for corporate control. Many empirical papers (Yeaple, 2003; Desbordes and Vicard, 2009; Busse, Königer and Nunnenkamp, 2010) provided a rationale for estimating gravity-like equations of FDI. Our paper belongs to these literature armed with discrete choice model and take multilateral effects into consideration.

Third, our paper also belongs to the growing branch of literature that incorporates country image into openness studies. Country image among nations has been shown to favor trade flows (Huang, Phau and Lin, 2010; Rose, 2016; Chang, Fujii and Jin, 2022), while research on foreign investment mainly focuses on cross-border micro capital markets (Brown et al., 2012; Bottazzi, Da Rin and Hellmann, 2010), corporate mergers and acquisitions (Ishii and Xuan, 2014). About macro FDI stocks, Kalamova and Konrad (2010) reveals that FDI flows into a host country rise as its country image improves. Guiso, Sapienza and Zingales (2009) points out that differences in bilateral trust affect the level of bilateral portfolio investments and foreign direct investments. The empirical part of this paper draws on Chang, Fujii and Jin (2022) and Guiso, Sapienza and Zingales (2009), both of which provide informative analyses on the impact of country image on bilateral trade and FDI, respectively.

Third, this paper contributes the literature on determinants and implifications of FDI. Several research have investigated different macro-economic variables affecting the FDI including country size (Gopinath and Echeverria, 2004; Portes and Rey, 2005), excahnge rates (Harms and Knaze, 2021), bilateral trade (Neary, 2009; Kahouli and Maktouf, 2015), financial developmet (Davies, Desbordes and Ray, 2018) and the impact of economic integration (Rose and Van Wincoop, 2001; Baltagi, Egger and Pfaffermayr, 2008; de Sousa and Lochard, 2011). Inspired by this literature, we include a large number of FDI cost proxies in the empirical section to circumvent the omitted variable problem.

3 Theoretical Model

We consider a world comprised of N countries and use a multinational production model developed by Arkolakis et al. (2018) and Wang (2021), which allows firms invest and produce outside their original country and use their foreign affiliates as export platforms. We use index i to denote the firms' country of source (the FDI investor), index ℓ to denote the production country (the FDI investee) and index n to denote the improted country where multinationals sell their products. Each country has one factor of production, labor L_i, which is paid w_i and produces a continuum of goods indexed by $\omega \in \Omega$. Under the assumption of CES preferences with the elasticity of substitution $\sigma > 1$, the demands of country n can be expressed as:

$$q_n(\omega) = \left(\frac{p_n(\omega)}{P_n}\right)^{-\sigma} \frac{X_n}{P_n} \tag{1}$$

with the price index:

$$P_n = \left(\int_{\omega\in\Omega} p_n(\omega)^{1-\sigma} d\omega\right)^{\frac{1}{1-\sigma}} \tag{2}$$

where $p_n(\omega)$ is the price of good ω in country n and X_n is the total expenditure in country n.

3.1 Firms Choice

Each good ω is potentially produced by a single firm under monopolistic competition. A firm in country i can enter the market and create the good ω after paying a fixed cost f^e. Following Melitz (2003), we regard this creation of firms that sell differentiated goods in monopolistically competitive markets as *innovation*. Post entry, firms can produce anywhere in the world with different productivities. A firm is characterized by a vector of productivities $\mathbf{z} = (z_{i1}(\omega), z_{i2}(\omega), ..., z_{i\ell}(\omega))$, where $z_{i\ell}(\omega)$ is the productivity of a firm ω originated from country i producing in country ℓ.

Firms incur various costs when operating outside of their original countries and exporting goods across countries. There is an iceberg cost $\gamma_{i\ell}$ associated with using home technology from i to produce in ℓ, where $\gamma_{i\ell} \geq 1 (\gamma_{\ell\ell} = 1)$ denotes FDI costs that multinationals face when operating in a different country. Moreover, trade from country ℓ to country n incurs an iceberg cost $\tau_{\ell n} \geq 1$, with $\tau_{nn} = 1$.

First, Due to the CES preferences and monopolistically competitive markets, if a firm ω originated from country i would like to serve market n by its affiliate in country ℓ will charge a markup $\tilde{\sigma} = \frac{\sigma}{\sigma-1}$ over its marginal costs

$$\tilde{c}_{i\ell n}(\omega) = \frac{\xi_{i\ell n}}{z_{i\ell}(\omega)}, \quad \text{where } \xi_{i\ell n} = \gamma_{i\ell}\tau_{\ell n}w_{\ell} \tag{3}$$

Second, We assume that firms from orignal (source) country i would adjust their expected profits when considering ℓ as best investing and producing sites to serve the market n, i.e., risk perception, based on a subjective evaluation of the destination (host) country, $\eta_{i\ell}$, with a monotone increasing function $\eta_{i\ell} = F(PS_{i\ell})$. $PS_{i\ell}$ is the variable depicting country image perceptions from the survey data which will be demonstrated below. The expectation factor $\eta_{i\ell}$ is a key parameter linking country image and FDI. The higher $PS_{i\ell}$ means the better country image perception of i on country ℓ, thus investors and enterprises in country i would increase profit expectations on their operations in country ℓ. Using expressions of marginal costs and demands, the expected profit of a firm from country i serves market n by producing in ℓ can be expressed by:

$$E_{z_{i\ell}(\omega)}(\Pi_{i\ell n}) = E_{z_{i\ell}(\omega)}\left(\eta_{i\ell}\frac{1}{\sigma}\tilde{\sigma}^{1-\sigma}\tilde{c}_{i\ell n}(\omega)^{1-\sigma}X_n P_n^{\sigma-1}\right) \tag{4}$$

Then a firm originated from country i will choose its investment or production site ℓ to serve market n by minimizing its expectation-adjusted unit cost:

$$\ell = \arg\min_k\{c_{ikn}(\omega)\} = \arg\min_k\{\eta_{ik}^{\frac{1}{1-\sigma}}\frac{\xi_{ikn}}{z_{ik}(\omega)}\} \tag{5}$$

Third, the firm chooses to serve the market n only if its associated variable profits are enough to cover the fixed marketing cost $w_n F_n$ into the final market n. Then we can derive the maximum unit cost, i.e., the market entry cutoff under which the firm will enter the market n is:

$$c_n^* = \left(\frac{\sigma w_n F_n}{X_n}\right)^{\frac{1}{1-\sigma}}\frac{P_n}{\tilde{\sigma}} \tag{6}$$

3.2 Aggregation

We need to obtain analytic expressions for the aggregated varibles such as FDI and trade volumes. Following Wang (2021), we assume that the productivity vector of firms is randomly drawn from a multivariate Pareto distribution:

$$\begin{aligned} &\text{Prob}\left[z_{i1}(\omega) \le z_1, \ldots, z_{iN}(\omega) \le z_N\right] = 1 - T_i \left[\sum_{\ell=1}^{N} A_\ell z_\ell^{-\frac{\theta}{1-\rho}}\right]^{1-\rho} \\ &\textit{support} \quad z_\ell \ge \tilde{T}_i := T_i^{\frac{1}{\theta}} \left[\sum_{\ell=1}^{N} A_\ell^{\frac{1}{1-\rho}}\right]^{\frac{1-\rho}{\theta}} \end{aligned} \tag{7}$$

where $\rho \in [0,1)$ and $\theta > \max\{1, \sigma - 1\}$. Under the assumption that $\eta_{i\ell}^{\frac{1}{1-\sigma}} \xi_{i\ell n} > \tilde{T}_i c_n^*$ which assures there exists firms from i will not choose to serve market n, then the share of expenditure by country n on goods produced in country ℓ with FDI from country i is:

$$\pi_{i\ell n} = \frac{X_{i\ell n}}{X_n} = \psi_{i\ell n} \lambda_{in} \tag{8}$$

where $\psi_{i\ell n} = \frac{A_\ell (\eta_{i\ell}^{\frac{1}{1-\sigma}} \xi_{i\ell n})^{-\frac{\theta}{1-\rho}}}{\Psi_{in}^{\frac{1}{1-\rho}}}$ denotes the probability that country ℓ is the production site provided that country i is the origin of imports of country n and $\Psi_{in} = \left[\sum_{\ell=1}^{N} A_\ell (\eta_{i\ell}^{\frac{1}{1-\sigma}} \xi_{i\ell n})^{-\frac{\theta}{1-\rho}}\right]^{1-\rho}$. $\lambda_{in} = \frac{M_i T_i \Psi_{in}}{\sum_k M_k T_k \Psi_{kn}}$ represents the probability that the origin of goods imported by n is country i, and M_i is the mass of firms in country i. This equation shows that the multinationals' export-platform networks or trilateral trade flows $\{X_{i\ell n}\}$ depend on technologies, factor prices, final market size, FDI costs, country image effects and trade frictions. To link this structural equation with the actual bilateral FDI data, we denote model-driven bilateral FDI by $X_{i\ell}^{fdi} = \sum_{n=1}^{N} X_{i\ell n}$.

3.3 Equilibrium

It is noted that we can express the equlibrium using a vector $\{w_i, M_i\}$ based on the convenient property of multivariate Pareto distribution, because the total fixed marketing cost and total net profit of multinationals are fixed proportions of trilateral trade flows $\{X_{i\ell n}\}$. As showed in Appendix A, The fixed marketing cost has a share of $s = \frac{\theta - (\sigma - 1)}{\theta\sigma}$ and the total net profits of firms have a share $\tilde{s} = \frac{1}{\sigma} - s = \frac{\sigma - 1}{\theta\sigma}$ in the $\{X_{i\ell n}\}$, respectively.

Thus, we consider two market clearing conditions. The labor market clearing condition for a country ℓ requires the total labor income equals the sum of three sections: the production wage when ℓ is the investee and production country, the marketing wage when ℓ is the final market and the associated net profits from offshoring when ℓ is the origin country of multinationals. The equlibrium wage is determined by the labor market clearing condition which requires:

$$\underbrace{w_\ell L_\ell}_{\text{Laobr income}} = \underbrace{\left(\frac{1}{\tilde{\sigma}}\right)\sum_{i,n} X_{i\ell n}}_{\text{Production Wage}} + \underbrace{s\sum_{i,k} X_{ik\ell}}_{\text{Marketing wage}} + \underbrace{\tilde{s}\sum_{k,n} X_{\ell kn}}_{\text{Profit}} + \Delta_\ell \tag{9}$$

where Δ_ℓ is exogenous current account imbalances as in Dekle, Eaton and Kortum (2008), with $\sum_\ell \Delta_\ell = 0$.

We calculate country-specific current account imbalances using equation (A.11) and allocate world imbalances $\sum_\ell \Delta_\ell$ to each country in proportion to its output share of the world. More importantly, we eliminate imbalances in the initial equlibrium and set $\Delta_\ell = 0$ in subsequent counterfactual analysis. The equilibrium firm mass M_i is determined by the free entry condition:

$$M_i w_i f^e = \tilde{s}\sum_{\ell,n} X_{i\ell n} \tag{10}$$

The welfare in country n can be expressed by real wage $W_n = \frac{w_n}{P_n}$, where the price index is:

$$P_n^{-\theta} = \zeta^\theta \left(\frac{w_n F_n}{X_n}\right)^{-\frac{\theta-(\sigma-1)}{\sigma-1}} \left[\sum_k M_k T_k \Psi_{kn}\right] \tag{11}$$

with $\zeta = \left(\frac{\tilde{\sigma}^{1-\sigma}\theta}{\theta-\sigma+1}\right)^{\frac{1}{\theta}} \left(\frac{\sigma}{\tilde{\sigma}^{1-\sigma}}\right)^{\frac{\sigma-1-\theta}{\theta(\sigma-1)}}$

The measure of gains from openness (GO) , which is defined as the change in real incomes moving from a counterfactual equlibrium with no trade and FDI to the observed equilibrium, is a function of trilateral trade flows:

$$GO_n = \underbrace{\left(\frac{\sum_\ell X_{n\ell n}}{\sum_{i,\ell} X_{i\ell n}}\right)^{-\frac{1}{\theta}}}_{\text{Foreign technology effects}} \underbrace{\left(\frac{X_{nnn}}{\sum_\ell X_{n\ell n}}\right)^{-\frac{1-\rho}{\theta}}}_{\text{Offshoring effects}} \underbrace{\left(\frac{\sum_{i,\ell} X_{ni\ell}}{\sum_{i,\ell} X_{i\ell n}}\right)^{\frac{1}{\theta}}}_{\text{Innovation effects}} \tag{12}$$

The first term on the right-hand-side, foreign technology effects, refers to the gains for a country n from being able to consume goods produced with foreign technologie (no matter where production takes place). The second term, offshoring effects, captures the gains for country n from being able to use its own technologies abroad and import the goods back for domestic consumption.[4] The third term, innovation effects, captures the gains for a country

[4]This model does not include intra-firm imports, thus this changes of term is trivial. As indicate by Arkolakis et al. (2018), given the equilibrium $\{X_{i\ell n}\}$, $\rho > 0$ leads to lower gains than $\rho = 0$ since correlated productivity draws imply that the gains from offshoring effects are not significant. One can refer to Wangzi(2021) which captures significant offshoring effects by adding extra multinational sales cost to the model.

n from being specialized in innovation. In the model we used, the country image shift affects foreign investor i's expected profits or expected inward FDI cost into country ℓ. When a country n encounters a decline in its country image, multinationals perceives higher FDI cost , thus would circumvent investing and producing in ℓ. This causes welfare losses of ℓ from being less accessible to goods produced by foreign technologies. On the contrary, the country ℓ would tend to more specialize in innovation to offset the welfare losses due to the home market effect in innovation proved by Arkolakis et al. (2018). The final welfare change depends on the comparison of the two forces.

3.4 Equilibrium in relative changes

In order to investigate counterfactual effects of country image on FDI, trade and welfare around the world. We use the exact hat algebra popularized by Dekle, Eaton and Kortum (2008) to solve for the counterfactual state of the global economy in response to any change in model fundamentals: country image. We can express the relative changes in equilibrium outcomes in terms of exogenous shocks, parameters (θ, ρ, σ), and trilateral trade flows $\{X_{i\ell n}\}$.

Proposition 3.1. *Let x' denote the counterfactual value of a variable x and $\hat{x} \equiv x'/x$ the change ratio. Given exogenous shocks $(\hat{\eta}_{i\ell}, \hat{\gamma}_{i\ell}, \hat{\tau}_{\ell n})$ and $\{X_{i\ell n}\}$. Then the equilibrium vector $(\hat{w}_i, \hat{M}_i)$ can be solved by the system of equations:*

1. Labor market clearing conditions in relative changes:

$$w_\ell L_\ell \hat{w}_\ell = \left(\frac{1}{\tilde{\sigma}}\right) \sum_{i,n} X_{i\ell n} \hat{\pi}_{i\ell n} \hat{w}_n + s \sum_{i,k} X_{ik\ell} \hat{\pi}_{ik\ell} \hat{w}_\ell + \tilde{s} \sum_{k,n} X_{\ell kn} \hat{\pi}_{\ell kn} \hat{w}_n \tag{13}$$

where $\hat{\pi}_{i\ell n} = \hat{\psi}_{i\ell n} \hat{\lambda}_{in}$, with

$$\hat{\psi}_{i\ell n} = \frac{(\hat{\eta}_{i\ell}^{\frac{1}{1-\sigma}} \hat{\xi}_{i\ell n})^{-\frac{\theta}{1-\rho}}}{\hat{\Psi}_{in}^{\frac{1}{1-\rho}}}, \quad \hat{\Psi}_{in} = \left[\sum_{\ell=1}^{N} \psi_{i\ell n} (\hat{\eta}_{i\ell}^{\frac{1}{1-\sigma}} \hat{\xi}_{i\ell n})^{-\frac{\theta}{1-\rho}}\right]^{1-\rho}, \quad \hat{\lambda}_{in} = \hat{M}_i \hat{\Psi}_{in} \hat{P}_n^{\theta}$$

and where

$$\hat{P}_n = \left[\sum_k \lambda_{kn} \hat{M}_k \hat{\Psi}_{kn}\right]^{-\frac{1}{\theta}}, \quad \hat{\xi}_{i\ell n} = \hat{\gamma}_{i\ell} \hat{\tau}_{\ell n} \hat{w}_\ell. \tag{14}$$

2. Free entry condition in relative changes:

$$\hat{M}_i \hat{w}_i M_i w_i f^e = \tilde{s} \sum_{\ell,n} X_{i\ell n} \hat{\pi}_{i\ell n} \hat{w}_n \tag{15}$$

3. Welfare in relative changes:

$$\hat{W}_i = [\underbrace{\hat{\lambda}_{ii}^{-\frac{1}{\theta}}}_{\text{Foreign Technology}} \underbrace{\hat{\psi}_{iii}^{-\frac{1-\rho}{\theta}}}_{\text{Offshoring}}] \underbrace{\left(\frac{\hat{Y}_i^f}{\hat{X}_i}\right)^{\frac{1}{\theta}}}_{\text{Specialization in Innovation}} \tag{16}$$

where

$$Y_i^f := \sum_{n,\ell} X_{i\ell n}$$

3.5 FDI gravity

Recall the definition of bilateral FDI: $X_{i\ell}^{fdi} = \sum_{n=1}^{N} X_{i\ell n} = \sum_{n=1}^{N} \frac{A_\ell(\gamma_{i\ell}\tau_{\ell n}w_\ell)^{-\frac{\theta}{1-\rho}}\eta_{i\ell}^{-\frac{\theta}{(1-\rho)(1-\sigma)}}}{\Psi_{in}^{\frac{1}{1-\rho}}}\lambda_{in}X_n$, we can derive the gravity equation of FDI:

$$\ln(X_{i\ell}^{fdi}) = \underbrace{\ln(M_i T_i)}_{\text{Source country FE}} \underbrace{+\ln A_\ell - \frac{\theta}{1-\rho}\log(w_\ell)}_{\text{Host country FE}} - \underbrace{\frac{\theta}{(1-\rho)(1-\sigma)}\ln\eta_{i\ell}}_{\text{Country image effect}} - \underbrace{\frac{\theta}{1-\rho}\ln\gamma_{i\ell}}_{\text{Bilateral FDI cost}}$$
$$+ \underbrace{\ln\sum_{n=1}^{N}\frac{\tau_{\ell n}^{-\frac{\theta}{1-\rho}}}{M_i T_i \Psi_{in}^{\frac{1}{1-\rho}}}\lambda_{in}X_n}_{\text{Third-country effect via trade}} \tag{17}$$

Similar to the widely used FDI gravity equation, equation (17) suggests that bilateral FDI depends on the source country fixed effects (including the number of multinationals and technology level of the source country), the host country fixed effects (including the technology level and factor prices of the host country), and the bilateral FDI costs. Due to the characteristic of multivariate Pareto distribution, there is an additional term occuring in equation (17), representing the third-country effect via trade. This term reveals that FDI decision between i and ℓ would be affected by both their ability to penetrate into final markets n around the world. For example, China is the country of origin i and Canada is the country of production ℓ. Given the tensions between the U.S. and China, Chinese multinationals that want to enter the U.S. market will prefer to invest in Canada for production because of Canada's lower trade costs and better bilateral trust to the U.S. In practice, we can also absorb this term by adding more bialteral gravity controls because of the summation sign.

In addition, the profit expectation factor $-\frac{\theta}{(1-\rho)(1-\sigma)}\ln\eta_{i\ell}$ is another extra FDI promoters term in our equation. We hypothesize that a change in bilateral country image perception ($PS_{i\ell}$) could affect this effect such that $-\frac{\theta}{(1-\rho)(1-\sigma)}\ln\eta_{i\ell} = \alpha_0 + \kappa PS_{i\ell}$, where κ captures the logarithmic changes in FDI values associated with a one-percentage point increase in $PS_{i\ell}$.[5] Further, assume that the unobserved FDI costs depend on the observable FDI-cost proxies $\mathbb{Z}_{i\ell,t}$ such that $-\frac{\theta}{1-\rho}\ln\gamma_{i\ell} = \beta_0 + \beta^T\mathbb{Z}_{i\ell}$. This implies an econometric equation:

$$\ln\tilde{X}^{fdi}_{i\ell,t} = \alpha + \kappa PS_{i\ell,t} + \beta^T\mathbb{Z}_{i\ell,t} + \nu_{i,t} + \mu_{\ell,t} + \varepsilon_{i\ell,t} \tag{18}$$

where $\tilde{X}^{fdi}_{i\ell,t}$ denotes bilateral FDI stock values from actual data, which is the FDI category for which most data are available and which is also the theoretically consistent measure;[6] $\nu_{i,t}$ is source-year fixed-effect terms, which captures other source-year specific shocks; $\mu_{\ell,t}$ is host-year fixed-effect terms, which captures shocks specific to the host-year. We control for a long list of FDI-cost proxies and traditional gravity controls, including bilateral distance, language proximity, legal origin, colonial relationship, border dummy, regional trade agreements (RTAs), currency unions, tariff measures, bilateral tax rate difference, exchange rate, and investment policy measures. Further details on the measurement of these variables are provided in Appendix B.

The theoretical and empirical literature suggest that key determinants of FDI are likely to be market size, income level, institutional quality, restrictions on outward and inward FDI, trade costs, and differences in factor endowments. However, as pointed out by Blonigen and Piger (2014), this list of determinants is by no means exhaustive. As introduced, instead of trying to account explicitly for all these factors in our model, we implicitly control for all the determinants of bilateral FDI at the country levels by including time-varying country-specific fixed effects in our econometric model. In this way, we limit the risk of functional form misspecification, i.e., omitted variable bias. We will empirically reveal effects of country image on bilateral FDI and estimate the key parameter $\eta_{i\ell}$ using (18).

4 Data and Calibration

In this section, we interpret measures of dependent and independent variables used in econometric estimations and calibrate the model to actual aggregate bilateral trade and FDI data for future counterfactual analysis. First, we introduce the measure of country images from a survey called BBC World Service Poll, which has been widely used in empirical trade literature (Rose, 2016; Chang, Fujii and Jin, 2022); Second, we explain the source of FDI stocks

[5] This means $\eta_{i\ell} = \left(e^{\kappa PS_{i\ell}}\right)^{\frac{(1-\rho)(1-\sigma)}{-\theta}}$.

[6] Although the model we used was first proposed by Arkolakis et al. (2018) to portray multinational production (MP), comprehensive data are lacking in reality. Thus, FDI stocks is a commonly used bilateral measure of MP activity, which have a strong correlation with actual MP. Ramondo, Rodríguez-Clare and Tintelnot (2015) shows the correlation between MP sales and FDI stocks is 0.85.

data and trade data used in both empirical estimations and counterfactual analysis. In the counterfatual analysis, we use a sample of 54 countries or economies, which has large extent of economic scales and openness, and a ROW (rest of the world); Third, we calibrate some essential parameters and trilateral trade flows $\{X_{i\ell n}\}$, which leads to point estimates of the counterfactual analysis, based on the method used by Arkolakis et al. (2018).

4.1 Measures of Country Image

The proxy varibale for country image comes from the BBC World Service Poll, which was conducted annually between 2005 and 2014 an in 2017 by GlobalScan[7] and PIPA[8]. Following Chang, Fujii and Jin (2022), we use the data between 2005-2014 in econometric analysis and inclued the data in 2017 for counterfactual analysis.

In each round of the survey, about one thousand respondents in each (evaluating) country were interviewed face-to-face or by phone. The respondents were asked: *whether they thought each of the evaluated countries was having a mainly positive or mainly negative influence in the world*. Other than "mainly positive" and "mainly negative", the recorded responses included "depends", "neither, neutral", "DK/NA (don't know or no answer)", even though these choices were not volunteered by the interviewer. We treat both "depends" and "neither, neutral" answers as "neutral".

Table 1 shows the list of evaluated and evaluating countries, as well as the years in which the countries are covered in the survey. The evaluated countries are often big economic powers or politically sensitive countries with strained international ties. In terms of geographical location, political system and economic structure, the group of evaluating countries is rather heterogeneous. As shown in Table 1, the number of evaluated countries expanded from 6 in 2005 to 15 (excluding North Korea, for which we do not have credible GDP numbers) in 2010. The number of evaluating countries varied between 17 and 24.

When matching foreign investment transactions, the bargaining power normally rests on source/origin countries because they can decide whether or not to deploy investments in host countries based on their perception on host/destination countries. Thus, to measure bilateral country image perception, we use the proportion of respondents in evaluating country i who said at the beginning of year t that evaluated country ℓ had a primarily positive (negative) influence in the world, and label it as the positive (negative) response ratio of source/origin country i on host/destination country ℓ, i.e., $PS_{i\ell,t}$ ($NG_{i\ell,t}$). In contrast, Chang, Fujii and Jin (2022) calculates country-of-origin effects on trade flows and treats evaluated and evaluating countries as trade flows origins and destinations, respectively. For most records

[7]https://globescan.com/tag/bbc-world-service-survey/

[8]https://publicconsultation.org

(country-pair-years), we also have the neutral response ratio $NU_{i\ell,t}$ and the proportion $NA_{i\ell,t}$ of respondents who gave no answer or said "don't know".

Figure 1 from Chang, Fujii and Jin (2022) depicts the country images of the evaluated countries. The left side of the figure reports the average positive response ratio $\overline{PS}_{\ell,t}$ and the right side reports the average negative response ratio $\overline{NG}_{\ell,t}$ towards country ℓ, where the averages are taken over the evaluating countries i. Over the sample period, countries such as Canada and Germany had consistently good country image, while countries such as Iran and Pakistan, on the other hand, had persistently bad country image.

While country rankings in terms of $\overline{PS}_{\ell,t}$ and $\overline{NG}_{\ell,t}$ have been generally consistent over time, there are notable outliers. For example, the U.S.'s country image increased by as much as 17.7% between 2007 and 2011. This corresponded with the transition of power from Bush to Obama. In the previous period, the U.S.'s blatant invasion of the Middle East and the market factors that triggered the financial crisis both tarnished its country image and undermined investor confidence. It was only in this period, with the stepping down of Bush, that Obama's moderate foreign policy led to the gradual recovery of the U.S. country image to its peak. During 2009 to 2012, China's country image has also jumped, thanks to its increased global economic status and the hosting of major world events such as the Beijing Olympics and the Shanghai World Expo. In counterfactual analysis, we will further exploit effects of country image changes on these two countries.

4.2 Foreign Direct Investment

FDI figures are derived from two sources. The primary source is the Coordinated Direct Investment Survey (CDIS) led by the IMF, which includes bilateral direct investment positions between 274 countries, regions and economies from 2009 to present.[9] We use the term *"IIW_ BP6_USD"* in CDIS as inward FDI data and *"IOW_ BP6_USD"* as outward FDI data, respectively. We note that FDI data from CDIS refers to FDI stock not flows, because it is based on records for asset and liability positions. To achieve optimum coverage of countries, mirror data from partner nations are also utilized. The other source is the bilateral FDI Statistics database from UNCTAD, which includes inflows, outflows, inward stock, and outward stock for 206 countries from 2001 to 2011. We use the data between 2001 and 2008 to append with data from CDIS, consisting of 54 countries and rest of the world (ROW).[10] To mitigate the

[9] http://data.imf.org/CDIS

[10] ROW encompasses 40 countries and economies: Angola(AGO), Albania(ALB), Azerbaijan(AZE), Bulgaria(BGR), Bosnia and Herzegovina(BIH), Belarus(BLR), Bolivia(BOL), Brunei Darussalam(BRN), Botswana(BWA), Coted'Ivoire(CIV), Cameroon(CMR), Congo(the Democratic Republic of)(COD), Congo(COG), Algeria(DZA), Ecuador(ECU), Estonia(EST), Ethiopia(ETH), Gabon(GAB), Croatia(HRV), Iceland(ISL), Jamaica(JAM), Kazakstan(KAZ), Kuwait(KWT), Sri Lanka(LKA), Lithua-

impact of profit shifting, we also removed tax haven country or regions.[11] Throughout the research, we underline that the estimation is based on FDI stocks (positions), which is the FDI category for which the most data are available and is also the theoretically consistent measurement. For the intra FDI stocks (domestic investment) which will be used in counterfactual analysis, we calculate it using the difference between the national captial stocks and total FDI stocks, i.e., $\tilde{X}_{ii}^{fdi} = X_i^{capital} - \sum_{k \neq i} \tilde{X}_{ki}^{fdi}$ with the capital stock at constant 2005 national prices (in mil.US$) from the Penn World Table. Figure 2 indicates that there is a significant positive correlation between bilateral FDI and country image proxy $PS_{i\ell}$.

4.3 Trade Flows

The Correlates of War (COW) project's International Trade dataset is used to calculate aggregate merchandise trade flows.[12] The COW merchandise trade numbers are sourced from the IMF's Direction of Trade Statistics (DOTS) (IMF). If missing import entries are available, COW replaces them with the matching export items reported by the counterparty in DOTS. In the same way as COW develops its trade dataset, we fill in remaining missing pieces of COW trade data with corresponding DOTS import values, if available, and with corresponding DOTS export values, if the former is also missing.

In addition to merchandise trade, we also gather data from the "WTO-UNCTAD-ITC annual trade in services dataset" regarding bilateral service trade. "Trade in commercial services, 2005-onwards (BPM6)" and "Trade in commercial services, 1980-2013 (BPM5)" are the accessible databases. We prioritise the records under *"Memo item: Total services" (with code "S200")* from BPM6 and supplement any missing entries with data from BPM5 if available. We further supplement any remaining missing entries with data from the World Bank's "Trade in Services Database" if available. The overall bilateral trade flows used in this paper consist of the sum of bilateral merchandise and service trade flows. Domestic sales (internal trade flows) are determined by subtracting total imports from outputs.

4.4 Calibration

We calibrate from the literature for some parameters required to run counterfactuals with our model. The elasticity of substitution (σ= 4), which is about the median and very close to

nia(LTU), Latvia(LVA), Oman(OMN), Philippines(PHL), Paraguay (PRY), Sudan(SDN), Senegal(SEN), El Salvador(SLV), Trinidad and Tobago(TTO), Tunisia(TUN), Tanzania(TZA), Uzbekistan(UZB), Viet Nam(VNM), Yemen(YEM), Zambia(ZMB), Zimbabwe(ZWE)

[11]The list of tax havens is from the Worlddata website (https://www.worlddata.info/tax-havens.php), which aggregates a list of 49 tax havens as judged by 5 different organizations.

[12]https://correlatesofwar.org

the preferred reported value by Head and Mayer (2014). Parameters of multivariate Pareto distribution comes from Arkolakis et al. (2018), i.e., $\theta = 4.5$ and $\rho = 0.55$. It is noted that the key expectation parameter $\eta_{i\ell}$ would be computed from the econometric estimation in section 5.

The quantification requires the data on trilateral trade flows $\{X_{i\ell n}\}$, which are not directly observed in the real data. We follow the method introduced by Arkolakis et al. (2018) to impute $\{X_{i\ell n}\}$ from bilateral trade and FDI stocks data, given the parameters (σ, θ, ρ). Recall the equation (8) for trilateral trade shares and let $\tilde{T}_{i\ell} = (M_i T_i)^{-\frac{1}{\theta}} \eta_{i\ell}^{\frac{1}{1-\sigma}} \gamma_{i\ell}$ and $\tilde{\tau}_{\ell n} = A_\ell^{-\frac{1-\rho}{\theta}} \tau_{\ell n} w_\ell$, the set of trilateral flows can be written as:

$$X_{i\ell n}(\tilde{\mathbf{T}}, \widetilde{\boldsymbol{\tau}}) = \frac{\tilde{T}_{i\ell}^{-\frac{\theta}{1-\rho}} \tilde{\tau}_{\ell n}^{-\frac{\theta}{1-\rho}} \left[\sum_{\ell=1}^{N} \tilde{T}_{i\ell}^{-\frac{\theta}{1-\rho}} \tilde{\tau}_{\ell n}^{-\frac{\theta}{1-\rho}}\right]^{-\rho}}{\sum_k \left[\sum_h \tilde{T}_{kh}^{-\frac{\theta}{1-\rho}} \tilde{\tau}_{hn}^{-\frac{\theta}{1-\rho}}\right]^{1-\rho}} \tag{19}$$

This equation implies that trilateral flows can be expressed in terms of two matrices $\tilde{\mathbf{T}} \equiv \{\tilde{T}_{i\ell}\}$ and $\widetilde{\boldsymbol{\tau}} \equiv \{\tilde{\tau}_{\ell n}\}$. Then we use the actual bilateral trade flows $\tilde{X}_{\ell n}^{trade}$ and FDI stocks $\tilde{X}_{i\ell}^{fdi}$ to solve the following $2 \times N^2$ moments:

$$\frac{\sum_i X_{i\ell n}(\widetilde{\mathbf{T}}, \widetilde{\boldsymbol{\tau}})}{X_n} = \frac{\tilde{X}_{\ell n}^{trade}}{X_n}, \quad \frac{\sum_n X_{i\ell n}(\widetilde{\mathbf{T}}, \widetilde{\boldsymbol{\tau}})}{\sum_{k,n} X_{k\ell n}(\widetilde{\mathbf{T}}, \widetilde{\boldsymbol{\tau}})} = \frac{\tilde{X}_{i\ell}^{fdi}}{\sum_k \tilde{X}_{k\ell}^{fdi}} \tag{20}$$

Using these $2 \times N^2$ moments, we can recover the set of $\tilde{\mathbf{T}} \equiv \{\tilde{T}_{i\ell}\}$ and $\widetilde{\boldsymbol{\tau}} \equiv \{\tilde{\tau}_{\ell n}\}$ and use them to solve for $\{X_{i\ell n}\}$. The imputed moments matrices can also be used to recover bilateral frictions with the assumption of symmetry bilateral frictions:

$$\eta_{i\ell}^{\frac{1}{1-\sigma}} \gamma_{i\ell} = \sqrt{\frac{\tilde{T}_{i\ell}\tilde{T}_{\ell i}}{\tilde{T}_{ii}\tilde{T}_{\ell\ell}}}, \quad \tau_{\ell n} = \sqrt{\frac{\tilde{\tau}_{\ell n}\tilde{\tau}_{n\ell}}{\tilde{\tau}_{\ell\ell}\tilde{\tau}_{nn}}}. \tag{21}$$

It is worth noting that unlike Arkolakis et al. (2018), which could recover exactly bilateral trade costs $\tau_{\ell n}$ and FDI costs $\gamma_{i\ell}$, we can not exactly recover all bilateral FDI costs $\gamma_{i\ell}$. To be specific, we can only use bilateral country image perceptions data from BBC World Service Poll with estimation results attained in section 5 to calculate $\eta_{i\ell}^{\frac{1}{1-\sigma}}$ and then compute the set of $\gamma_{i\ell}$ for country pairs covered in BBC World Service Poll. However the bilateral country image perceptions data only cover finite countries and periods in our full sample, thus we cannot separately recover all bilateral $\eta_{i\ell}^{\frac{1}{1-\sigma}}$ and $\gamma_{i\ell}$.

The summary statistics for calibration results in 2009 are listed in Table 2. The magnitude and stadard deviation of model-driven trade and FDI share indicates that our model has accurately matched actual bilateral trade and FDI data. Furthermore, we assess the accuracy of absolute values of trade flows and FDI stocks calibrated by our model. Figure 3 depicts outward and inward trade flows and FDI stocks at the country level, respectively. Trade flows for country n from the model and data are both normalized by absorption X_n, while FDI stocks for country n from the model and data are both normalized by capital stocks $X_n^{capital}$.[13] We can find that the absolute values calculated by the model match the actual data well overall, especially for FDI stocks, but slightly overestimate the value of imports and exports.

5 Regression Estimation

In this section, we empirically estimate the replationship between country image perceptions and bilateral FDI stocks and provide parameters to calculate relative changes in profits expectation $\hat{\eta}_{i\ell}$ using in the counterfactual analysis. In addition to estimate the benchmark equation (18), we also address potential endogeneity and omitted variables bias concerns. First, we do some robustness tests by including more block-block fixed effects and clustering at other dimensions. Second, we construct PS-based instrument variables, i.e., the third-country image, $PS_{i'\ell,t}$, of the same host country ℓ (or the third-country evaluation, $PS_{i\ell',t}$, by the same source country i) to address potential endogeneity. Finally, we employ the dynamic panel estimators of Arellano and Bond (1991) and Blundell and Bond (1998) to account for the possibility of omitted country-pair unobservables, serial dependency in FDI data, and reverse causality.

5.1 OLS and PPML Estimations

In this part, We run the benchmark estimation of equation (18) with OLS and PPML method, respectively. In Column 1 of Table 3, I include a long list of traditional gravity equation covariates, FDI policy measures and determinants as discussed in Appendix B. The estimation results indicate that an increase in the country image (positive response ratio) by 1% is associated with an increase of 1.955% in logarithmic FDI flows, which is bigger than tarde-promoting effects estimated by Chang, Fujii and Jin (2022) (1.359%). This impact is both statistically and economically significant. For example, the US average country image (in terms of $PS_{i\ell,t}$) improved by about 17.7% between 2007 and 2011. Given the result above, this implies a direct inward FDI-promoting effect of 41.3% ($=e^{1.955\times0.177}-1$). The China average country image (in terms of $PS_{i\ell,t}$) improved by about 10.3% between 2009

[13] We exclude interanl trade flows and FDI stocks

and 2012. Given the result above, this implies a direct inward FDI-promoting effect of 22.3% (=$e^{1.955\times0.103}-1$).

The estimates for other FDI determinants and costs proxy variables have the expected signs and reasonable magnitudes. For example, column 1 documents that 1% increase in distance is associated with a 0.681% decrease in FDI, and this effect is significant at the 5% statistic level. If two countries share a common history of being colonized ($ComCol_{i\ell}$), FDI from each other is on average 73.87% ($= 1 - e^{-1.342}$) lower; the coefficients of common region ($ComRegion_{i\ell}$) and common legal origin ($ComLeg_{i\ell}$) are both significantly positive, indicating that countries in a common region and share a common legal origin will have a higher level of FDI between countries. Bilateral investment agreements also contribute significantly to FDI, which is on average 1.19 times higher between countries that have signed bilateral investment agreements ($= e^{0.784}-1$); bilateral exchange rates play a positive role in promoting FDI, i.e., a depreciation of the host country's currency (and an appreciation of the source country's currency) will attract FDI entry. This result is consistent with the results of Tahir and Larimo (2005) due to the fact that a country can attract FDI by devaluing its own currency, and the depreciation of the local currency will reduce the relative production cost, making the initial investment cost in the host country lower.

Columns 2-4 in Table 3 dropped some insignificant traditional gravity controls and test the FDI promoting effects of different kinds of tariffs with non-tariff barriers, respectively. Results point that bilateral non-tariff barriers increase the possibility for source countries to use FDI as an alternative form to expand their foreign markets, while tariffs have no significant impacts on FDI.

In column 5 of Table 3, we allow bilateral FDI to depend on lagged bilateral perceptions $PS_{i\ell,t-1}$, which reveals lagged effects of bilateral perceptions, and contemporary changed term $\Delta PS_{i\ell,t}(= PS_{i\ell,t} - PS_{i\ell,t-1})$, which reflects revisions to bilateral perception due to recent events that occurred in the past year. The purpose of this regression is to conduct a rigorous test and identify the veracity of the impacts of bilateral country image perceptions. The lagged term $PS_{i\ell,t-1}$ is likely to capture the effects of country image up to a recent past, which could be more siginificant in investment decisions. The revision to country image $\Delta PS_{i\ell,t}$ perceived by i towards a host country ℓ over the past year could then be viewed as capturing the true effect of changes in investor preferences on investment. Both contemporary changed terms $\Delta PS_{i\ell,t}$ and lagged terms $PS_{i\ell,t-1}$ significantly boost bilateral FDI, according to the estimation results. To be specific, 1% improvement of $\Delta PS_{i\ell,t}$ and lagged terms $PS_{i\ell,t-1}$ are associated with 1.825% (=$e^{1.809\times0.01}-1$) and 2.24% (=$e^{2.215\times0.01}-1$) FDI increase, respectively.

In addition, the above estimations are repeated using Poisson's maximum likelihood method (PPML) (Silva and Tenreyro, 2006). Unlike OLS, PPML can effectively remove heteroskedasticity bias while also including samples with zero FDI values to boost estimate efficiency. Columns 6-10 in Table 3 give the PPML results corresponding to columns 1-5. It can be found that the PPML estimates of the $PS_{i\ell,t}$ coefficients are consistent with the conclusions of the OLS estimates. The conclusions regarding the other control variables are similar.

5.2 Robustness Tests

Since FDI and $PS_{i\ell,t}$ may differ systematically along the dimensions of bilateral political systems, development stages, or geographic regions, FDI between pairs of developed countries may be higher than average, or pairs of countries in the same political and economic union may give each other positive country image ratings. Therefore, we need to control for higher-level fixed effects and verify the robustness of the benchmark results by adding four further sets of block-block fixed effects and modifying the clustering levels of the standard errors. The first set of fixed effects is the combination of the development stage (Dev-Dev FE) of the source country (evaluating country) and the host country (evaluated country). Specifically, the first set of fixed effects consists of four fixed effects indicators: industrialized to industrialized, non-industrialized to non-industrialized, industrialized to non-industrialized and non-industrialized to industrialized; the second set of fixed effects is defined by the combination of whether the two countries are members of the OECD (OE-OE FE); the third set of fixed effects is defined by the combination of whether the two countries are members of the EU (EU-EU FE); the fourth set of fixed The fourth group of fixed effects is defined by the combination of whether the two countries are members of "Group of 20" (G20-G20 FE).

The regression results are presented in Table 4, where column 1 replicates column 1 in Table 3, and column 2 adds four sets of fixed effects to the source-year and host-year fixed effects, and it can be found that the regression results are similar to the benchmark results. Thus, the conclusion that the country image promotes FDI still holds after adding the new block-block fixed effects. Columns 3-4 further cluster the standard errors at the exporter-year and importer-year levels, and column 5 is based on the addition of four sets of fixed effects and further clustering of the standard errors at the exporter-year and importer-year levels, all results still support our conclusion. The subsequent columns 6-10 replicate the results of the first five columns one by one using the PPML approach, and it can be found that the country image's FDI promotion effect remains significant.

5.3 IV Estimations

The econometric model in this paper may suffer from endogeneity problems, especially endogeneity due to omitted variables. Assume some indeed omitted variable $z_{i\ell,t}$ such that the true residual are $\varepsilon_{i\ell,t} = z_{i\ell,t} + \bar{\varepsilon}_{i\ell,t}$ where $\bar{\varepsilon}_{i\ell,t}$ is white noise. Since $corr(PS_{i\ell,t}, z_{i\ell,t}) \neq 0$, it makes the model endogenous. It is further assumed that $PS_{i\ell,t}$ depends on the omitted variable $z_{i\ell,t}$ and other factors $h_{i\ell,t}$, i.e., $PS_{i\ell,t} = F(z_{i\ell,t}, h_{i\ell,t})$. At this point, we can consider constructing the country image perception variables $PS_{i'\ell,t}$ of third-party countries i' to the same host country ℓ as instrumental variables, provided that they satisfy the exclusivity assumption $corr(z_{i\ell,t}, z_{i'\ell,t}) = 0$ and the relevance assumption $corr(h_{i\ell,t}, h_{i'\ell,t}) \neq 0$. In other words, the third-party country instrumental variable $PS_{i'\ell,t}$ that we are looking for needs to satisfy two properties, one is relevance, the instrumental variables $PS_{i'\ell,t}$ must be correlated with the explanatory $PS_{i\ell,t}$. Second, exclusivity, where the instrumental variable is uncorrelated with the residual term, i.e., unobservables affecting FDI going from i' to ℓ will not be correlated with unobservables affecting FDI going from i to ℓ. [14]

For the relevance, we pairwise extracted the positive country image evaluation ratios $PS_{i\ell,t}$ and $PS_{i'\ell,t}$ for different evaluating countries i and i' in the sample for the same evaluated country ℓ, and computed the correlation coefficients $corr(PS_{i\ell,t}, PS_{i'\ell,t})$ for them in turn. Further, we also calculated $corr(\Delta PS_{i\ell,t}, \Delta PS_{i'\ell,t})$ by the above steps. Finally, a series of gravity variables are regressed on the correlation coefficient as the explanatory variable to explore the main bilateral factors affecting the correlation coefficient as a basis for the subsequent construction of third-party country instrumental variables in a grouped manner. The results are presented in Table B.2 and reveal that two countries whose perceptions of the same country image tend to be positively correlated generally share the following characteristics: speaking a common language ($ComLang_{i\ell}$), being at a common stage of development ($ComDev_{i\ell}$), being genetically similar ($GenDist_{i\ell}$) and not having been co-colonized ($ComCol_{i\ell}$). Based on the results of this regression, we construct instrumental variables. Grouped by common language indicator ($ComLang_{i\ell}$), we select a number of other countries i' that do not share common language with country i ($ComLang_{ii'} = 0$) and take the average of evaluation $PS_{i'\ell,t}$ of these countries on country ℓ, i.e., $PS_{i'\ell,t}^{ComLang,c}$ as IVs for $PS_{i\ell,t}$.

For exclusivity, we require that the IV is uncorrelated with the residual term, and the most stringent requirement can be that the variable used for grouping (e.g., $ComLang_{i\ell}$) is not significant for FDI in the benchmark regression in Table 3. Therefore theoretically, $PS_{i'\ell,t}^{ComLang,c}$ is an ideal IV in this paper. From the reality perspective, since countries that do

[14]Exclusivity requires that the instrumental variable is uncorrelated with the perturbation term, i.e., $corr(PS_{i'\ell,t}, \varepsilon_{i\ell,t}) = corr(z_{i'\ell,t}, z_{i\ell,t}) = 0$

not share a common language have relatively weak social, economic and cultural similarities, they are largely not subject to the same preference, trust shocks when faced with investment decisions in country ℓ, thus satisfying $corr(z_{i'\ell,t}, z_{i\ell,t}) \approx 0$.

We also consider an IV constructed in a similar way but based on how the country images are correlated across evaluated countries (ℓ, ℓ'). The ideal IVs need satisfy the exclusivity assumption $corr(z_{i\ell,t}, z_{i\ell',t}) = 0$ and the relevance assumption $corr(h_{i\ell,t}, h_{i\ell',t}) \neq 0$. Follow the former construction, we use the criteria of common border $Contig_{i\ell}$ to calculate a $\ell\ell'$-based IV $PS^{Contig,c}_{i\ell',t}$.

We finally choose $PS^{ComLang,c}_{i'\ell,t}$ and $PS^{Contig,c}_{i\ell',t}$ separately and jointly as IVs for the regressions, and Table 5 shows the results. Columns 1-3 show the results for ii'-based IVs, columns 4-6 for $\ell\ell'$-based IVs, and columns 7-9 for the joint IVs. In these approaches, we use IV GMM and IV PPML, respectively. columns 1, 4 and 7 present the IV GMM results, and it can be found that the coefficient of country image perception $PS_{i\ell,t}$ is still significantly positive, indicating that the promoting effect of country image on bilateral FDI still holds; columns 2, 5 and 8 present the first-stage regression results with F values much larger than 10, verifying the relevance assumption of IVs. Columns 3, 6 and 9 are the regression results for the IV PPML. Silva and Tenreyro (2010) points out that for some datasets, maximum likelihood estimates for Poisson regression may not exist, resulting in estimates that may not converge. In this paper, the *ivppml* command in STATA was initially used in practice but never converged, either because of potential systematic problems in the dataset that prevented convergence or because of the inclusion of a large number of fixed effects that brought about the "incidental parameter problem" in the PPML process.[15] Papke and Wooldridge (2008) points out that for nonlinear models, the endogeneity problem can be effectively dealt with by incorporating the residual term into the original equation and estimating it through a one-stage regression of the IVs, while pointing out that bootstrap sampling is needed to adjust the standard error of the second-stage regression. In practice, we use this "*control function*" method to estimate IV PPML.[16] The coefficient of $PS_{i\ell,t}$ is also significantly positive in the PPML estimation.

[15]The nonlinear model does not have the property of being an unbiased estimator, but only a consistent estimator, and the parameter estimates will converge to their true values if the standard error becomes arbitrarily small. Since the bias of the estimates increases with the ratio of the number of parameters to the number of observations, Fernández-Val and Weidner (2018), and the number of parameters for fixed effects increases with the number of observations, the bias of the estimates of the fixed effects parameters will gradually increase, leading to inconsistency, and also triggering other inconsistency in the parameter estimates.

[16]First, STATA command "reghdfe" is used to estimate the independent variable on IVs and predict the residual term. Second, STATA command "ppmlhdfe" is used to estimate the dependent variable on independent variables and residual term. Third, we repeat above procedures for 500 times to get adjusted standard errors by bootstrap sampling.

5.4 Dynamic Panel Estimations

In this subsection, we further employ Arellano and Bond (1991) dynamic panel estimation (differenced GMM) for the test. The use of dynamic panel estimation has two advantages: (1) it allows for serial correlation of the dependent variables and can mitigate possible reverse causality bias due to the interaction between FDI stocks in $t-1$ period and the country image in t period; (2) it helps to address omitted variable bias due to unobservable non-time-varying country-pair level characteristics.

Based on the equation (18), the first-order lagged term of the dependent variable, $\ln \tilde{X}^{fdi}_{i\ell,t-1}$, is added on the right-hand side. The contemporary changed term $\Delta PS_{i\ell,t}$ and the first-order lagged term $PS_{i\ell,t-1}$ of the bilateral country image perceptions are chosen as explanatory variables to more accurately express the impact of country image. More importantly, the coefficients of $\Delta PS_{i\ell,t}$ can also be used as a basis for subsequent counterfactual estimation. Specifically, we construct the following dynamic equation:

$$\ln \tilde{X}^{fdi}_{i\ell,t} = \alpha \ln \tilde{X}^{fdi}_{i\ell,t-1} + \rho_1 \Delta PS_{i\ell,t} + \rho_2 PS_{i\ell,t-1} + \beta^T \mathbf{Z}_{i\ell,t} + \nu_{i,t} + \mu_{\ell,t} + \delta_{i\ell} + \varepsilon_{i\ell,t} \tag{22}$$

where the country-pair fixed effects term $\delta_{i\ell}$ is used to absorb the country-pair non-time-varying variables in the FDI cost and gravity variables. After differencing, this non-time-varying variable will be removed, thus also helping to solve the problem of omitted variables at the country-pair level. The control variable matrix $\mathbf{Z}_{i\ell,t}$ of the dynamic equation will no longer contain the non-time-varying country-pair variables (e.g., bilateral distance). Further, defining the difference terms $\Delta x_t = x_t - x_{t-1}$ and $\Delta^2 x_t = \Delta x_t - \Delta x_{t-1}$, the first-order difference is made to the equation:

$$\Delta \ln \tilde{X}^{fdi}_{i\ell,t} = \alpha \Delta \ln \tilde{X}^{fdi}_{i\ell,t-1} + \rho_1 \Delta^2 PS_{i\ell,t} + \rho_2 \Delta PS_{i\ell,t-1} + \beta^T \Delta \mathbf{Z}_{i\ell,t} + \Delta \nu_{i,t} + \Delta \mu_{\ell,t} + \Delta \varepsilon_{i\ell,t} \tag{23}$$

To overcome the endogeneity problem, according to Arellano and Bond (1991), $\ln \tilde{X}^{fdi}_{i\ell,t-2}$ and higher order lagged terms are used as IVs for $\Delta \ln \tilde{X}^{fdi}_{i\ell,t-1} (= \ln \tilde{X}^{fdi}_{i\ell,t-1} - \ln \tilde{X}^{fdi}_{i\ell,t-2})$. Clearly, $\ln \tilde{X}^{fdi}_{i\ell,t-2}$ is correlated with $\Delta \ln \tilde{X}^{fdi}_{i\ell,t-1}$ and satisfies the relevance assumption. Second, as long as $\varepsilon_{i\ell,t}$ is not autocorrelated (to be verified), then $\ln \tilde{X}^{fdi}_{i\ell,t-2}$ and $\Delta \varepsilon_{i\ell,t} = \varepsilon_{i\ell,t} - \varepsilon_{i\ell,t-1}$ is not correlated because although $\ln \tilde{X}^{fdi}_{i\ell,t-2}$ is correlated with $\varepsilon_{ij,t-2}$, $\varepsilon_{i\ell,t}$ itself is not autocorrelated, at which point $\ln \tilde{X}^{fdi}_{i\ell,t-2}$ satisfies the exclusivity assumption and is a valid IV. Further, in this paper, allowing both the contemporary changed term and the lagged term of bilateral country image perceptions to be endogenous, then for the contemporary changed term, $\Delta PS_{i\ell,t-2}$ and higher order lagged terms are used as IVs of $\Delta^2 PS_{i\ell,t} (= \Delta PS_{i\ell,t} - \Delta PS_{i\ell,t-1})$. For lagged terms, $PS_{i\ell,t-2}$ and higher order lagged terms as IVs of $\Delta PS_{i\ell,t-1}(=PS_{i\ell,t-1}-PS_{i\ell,t-2})$.

Table 6 presents the results of the difference GMM where different orders of IV lags are used. First, two types of tests need to be concerned, one is the autocorrelation test of residuals (Arellano-Bond test), which can be found that the IVs are valid if the residual terms do not have autocorrelation of second order or higher. And the second is the over-identification test because the difference GMM uses too more IVs. It can be found that Hansen's J test accepts the original hypothesis that all moment conditions hold and passes the over-identification test. In summary, our results are convincing.

There is a positive serial correlation between bilateral FDI stocks, and 1% increase in FDI stocks in the previous period will bring about a 0.276-0.293% increase in FDI stocks in the current period. $\Delta PS_{i\ell,t}$ has a promoting effect on bilateral FDI stocks, and according to the results in column 1, a one-percent point increase in the country image of country ℓ will lead to a 5.259 percent point increase in FDI from country i to country ℓ. This result remains robust in the subsequent tests column 2-4 using higher order IVs of country images. Also, the coefficient of the lagged term $PS_{i\ell,t-1}$ of country image is also significantly, indicating that the impact of country image on FDI is persistent, and international tensions and deteriorating bilateral relations will affect long-term investors' confidence.

Subsequently, we also re-estimated the model using a system GMM approach (Blundell and Bond, 1998), which treats the difference equation (23) with the level equation (22) as a system of equations and the difference term of the lagged term of the endogenous variables as the IV of the level equation for GMM estimation. According to Table 7, the significance and direction of main coefficients do not change.

Given that dynamic panel estimation can mitigate the omitted variable bias and reverse causality problems of the empirical model, we will use the parameter estimate of $\kappa = 5.259$ in Table 6 column 1 as the key parameter in the counterfactual welfare analysis, which represents the partial direct effect of country image change on FDI. For example, China's average country image (in terms of $PS_{i\ell,t}$) improved by about 10.3% between 2009 and 2012. Given the previous parameters ($\sigma = 4, \theta = 4.5, \rho = 0.55$), this implies that the direct impact of country image on expectation factor is 1.577 ($\ln \eta = \frac{(1-\rho)(1-\sigma)}{-\theta}\kappa$). Hence, the improvement in China's country image over that time period is equivalent to 17.64% ($= e^{1.577\times 0.103} - 1$) decrease of its inward FDI cost, and 72.89% ($= e^{5.259\times 0.103} - 1$) of inward FDI stocks.

6 Counterfactual Estimation

Now we turn to investigate counterfactual effects of country image on FDI, trade and welfare around the world. Following Chang, Fujii and Jin (2022), we implement two types of counterfactual analysis caused by changes in different directions of exogenous country images. First, we compute the "*Bush effects*" by simulating the counterfactual welfare for the U.S. in year 2011 (the peak of the U.S. country image), if each of the U.S.'s investment partners were to change their actual ratings of the US in 2011 to the level in 2007 (the Bush regime) , holding the U.S.'s own preference parameters unchanged. Second, we compute the "*China rising effects*" by simulating the counterfactual welfare for China in year 2009, if each of the China's investment partners were to change their actual ratings of China in 2009 to the level in 2012 (the peak of the China country image). All simulated welfare effects are then compared to the total welfare gains from openness to evaluate the magnitude of importance of country image.

6.1 The Bush Effects

As shown in Figure 1, the U.S.'s country image experienced dramatic improvement from 2007 to 2011, during which the president changed from George W. Bush to Barack Obama. We compute the welfare effects for the USA in 2011 if the views of its potential investors were to revert to the level prevalent in 2007. We label this counterfactual exercise the "*Bush effect*". The public image of the Bush administration was deteriorated from two aspects. First, George W. Bush authorized the military invasion into Afghanistan in 2001 and Iraq in 2003 in its declared "War on Terrorism", driving negative ratings to soar in Muslim countries. And according to Pew Research Center, opposition to American foreign policy was widespread in western Europe, and positive views of the U.S. have declined steeply among many of its European allies.[17] Second, the Bush administration failed to prevent certain internal political groups from interfering with normal investment activities on national security grounds, resulting in a decline in the trust of many foreign investors in the U.S..[18] On the contrary, the next president Barack Obama gradually compeleted the withdrawal of combat troops in Iraq by August 2010 and implement many moderate foreign policies, helping trun around the U.S. country image. The mean positive response to U.S. of sample countries is 0.48 in 2011 but 0.31 in 2007, which implies $23.5\%(= 1 - e^{1.577\times -0.17}$) drops in mean $\eta_{i,USA}$, thus $59.1\%(= 1 - e^{5.259\times -0.17})$ drops in mean bilateral FDI.

The counterfactual welfare results of the U.S. and other evaluating countries are reported in Table 9. We consider two scenarios. In scenario 1, source countries not included in the BBC WSP as evaluating countries are assumed not to have changed their perceptions towards the U.S.. In scenario 2, these countries are assumed to take on the mean change (of the sample

[17]Pew Research Centers Pew Global Attitudes Project: https://www.pewresearch.org/global/2008/12/18/global-public-opinion-in-the-bush-years-2001-2008/

[18]Dubai Ports World controversy

countries) in the views towards the U.S.. Except for total wefare changes (columns 1 and 7) and three specific welfare effects (columns 2-4 and 8-10) interpreted by (16), we calculate the gains from openness (columns 5 and 11) and compare the simulated welfare effects to the gains from openness to measure the importance of country image (columns 6 and 12). As indicated, the *Bush effects* incur the U.S. 0.052%-0.064% loss of total welfare, which cost the country 1.924%-2.339% of its total gains from openness in two scenarios. The model implies that the drop of country image deters U.S. from accessing foreign technologies which is measured by $\lambda_{nn}^{-\frac{1}{\theta}}$. By the contrast, the model also suggests that U.S. will further specialize in innovation because relying on foreign technology and innovation are largely substitutes in this model. The decline in foreign trust in the U.S. has led to a subsequent decline in investment in U.S. production, making the U.S. less able to consume the products of foreign technologies ($\lambda_{nn}^{-\frac{1}{\theta}} \downarrow$) and thus more focuses on innovation ($\left(\frac{Y_n^f}{X_n}\right)^{\frac{1}{\theta}} \uparrow$) and offshores larger fraction of production ($\psi_{nnn}^{-\frac{1-\rho}{\theta}} \uparrow$). In addition, the result also indicates that emerging market countries such as China and Indonesia gains from the weaker image of the U.S. , because they do not heavily rely on investment in the U.S. and now could use more capitals to specialize in innovation. However, multinationals from developed countries with many affiliates in the U.S. can suffer welfare losses by voluntarily foregoing investment opportunities.

The counterfactual FDI and trade effects between the U.S. and other evaluating countries are reported in Table 10. First, Due to the downward shifts of country image, U.S. significantly loses a large fraction of inward FDI around 22.257%-44.425%. Among evaluating countries, Indonesia, Brazil and Korea are the three countries that would reduce their investment in the U.S. the most and that experienced the greatest decline in positive response to the U.S.'s country image. Second, it implies that trade and FDI are substitutes in our model as documented in Table 10 and this is due to the model characteristic and the current account balance condition. Countries losing their trust to invest in the U.S. instead export more to avoid risks. Figure 4 depicts the country-specific changes in U.S. exports and imports and inward and outward FDI brought about by the Bush effects. We find that inward FDI stocks from developing countries sharply declined, and as a alternative, trade plays a more important role in their openness to the U.S..

6.2 The China Rising Effects

From 2009 to 2012, China became a prosperous and remarkable country, averted the threat of the 2008 economic crisis, and increased national esteem and importance. As shown in Figure 1, the China's country image experienced dramatic improvement from 2009 to 2012, during which GDP of China has leapt to the second place in the world. Besides, the 2008

Olympics and the 2010 World Expo successfully demonstrated not only China's soft power, but also its infrastructure and technological innovation. We compute the welfare effects for China in 2009 if the views of its potential investors were to revert to the level prevalent in 2012. We label this counterfactual exercise the "*China rising Effects*". The mean positive response to China of sample countries is 0.394 in 2009 but 0.497 in 2012, which implies 17.64% increases in mean $\eta_{i,CHN}$ (drop in inward FDI cost), thus 72.89% increases in mean bilateral FDI.

The counterfactual welfare results of China and other evaluating countries are reported in Table 11. As indicated, the *China rising effects* bring China 0.014%-0.019% gains of total welfare, which makes up the country 0.878%-1.174% of its total gains from openness in two scenarios. The model implies that the increases of country image helps China to consume more goods produced with foreign technologies which is measured by $\lambda_{nn}^{-\frac{1}{\theta}} \uparrow$. By the contrast, due to the home market effect, China will further specialize on production ($\left(\frac{Y_n^f}{X_n}\right)^{\frac{1}{\theta}} \downarrow$) because more foreign investment is entering to forster production. And most countries have seen their welfare improve as a result of increased investment in China, demonstrating China's huge role in opening up the world.

The counterfactual FDI and trade effects between the China and other evaluating countries are reported in Table 12. First, Due to the upward shifts of country image, China significantly attracts a large fraction of inward FDI around 48.760%-66.033%. Among evaluating countries, Germany and Canada are the two countries that would increase their investment in China the most. Second, imports of China would drop due to more inward FDI which lead to enhanced production and exports. As showed in Table 8, Germany has changed its positive reponse to China rapidly with 0.11 in 2009 while 0.42 in 2012. This leads to a significant increase of the investment from Germany into China during that time (318.137% showed in Table 12). Possible reasons for this are (1) many high-level leaders visits between the two countries since 2009 have built confidence;[19] (2) the "Sino-German Joint Communiqué on the Comprehensive Promotion of Strategic Partnership" and agreement to establish a governmental consultation mechanism in July 2010 have also deepened mutual confidence and promoted bilateral investment and trade.

Figure 5 depicts the country-specific changes in China exports and imports and inward and outward FDI brought about by the China rising effects. We find that inward FDI stocks from European developed countries sharply increased. The substitute relationship between trade and FDI leads to a drop in imports from these countries. In addition, the entry of a large amount of FDI makes China more concentrated on the production side, which promotes

[19]Chairman Xi Jinping alone visited Germany three times as Vice Chairman and Chairman respectively. Merkel visited China 12 times during her 16 years in leadership.

China's exports to the world, especially developing countries.

7 Conclusion

The host country image is important for multinationals when investing and producing abroad, because the positive host country image helps to reduce the risk of globalization strategy and increase the expected profits. We introduce the country image perception into a quantitative trade and multinational production (MP) model built by Arkolakis et al. (2018). In our model, the image of the host country influences the expected profits of source countries, hence influencing FDI to the host country. We exploit a unique dataset, the BBC World Service Poll (WSP), to estimate the impact of country image on profits expectation of the source country towards the host country and the implied impacts on FDI.

Further, we implement two counterfactual analyses of significant shifts in the country image, given the estimated impact of country image on profits expectation and FDI. The one is the *Bush effects* in which we compute the welfare effects for the U.S. in 2011 if the views of its potential investors were to drop to the lower level in 2007. The other one is the *China rising effects* in which we compute the welfare effects for China in 2009 if the views of its potential investors were to jump to a higher level in 2012. Our results indicate that the *Bush effects* incur the U.S. 0.052%-0.064% loss of total welfare, which cost the country 1.924%-2.339% of its total gains from openness. In contrast, the *China Rising effects* bring China 0.014%-0.019% gains of total welfare or 0.878%-1.174% of its total gains from openness.

Table 1: The list of evaluating and evaluated countries in the BBC WSP survey

	Evaluated Countries (Years appearing in the survey)	Evaluating Countries (Years appearing in the survey)
Brazil (BRA)	2008-2014, 2017	2005-2008, 2010-2014, 2017
Canada (CAN)	2005-2007, 2009-2014, 2017	2005-2014, 2017
China (CHN)	2005-2014, 2017	2005-2014, 2017
France (FRA)	2005-2014, 2017	2005-2014, 2017
Germany (DEU)	2008-2014, 2017	2005-2014, 2017
India (IND)	2006-2014, 2017	2005-2014, 2017
Iran (IRN)	2006-2014, 2017	
Israel (ISR)	2007-2014, 2017	2014
Japan (JPN)	2006-2014, 2017	2005, 2008-2014
North Korea (PRK)	2007-2014, 2017	
Pakistan (PAK)	2008-2014, 2017	2010-2014, 2017
Russia (RUS)	2005-2014, 2017	2005-2014, 2017
South Africa (ZAF)	2009-2014, 2017	
South Korea (KOR)	2010-2014, 2017	2005-2008, 2010-2014
United States (USA)	2005-2014, 2017	2005-2014, 2017
United Kingdom (GBR)	2005-2014, 2017	2005-2014, 2017
Argentina (ARG)		2014
Australia (AUS)		2005-2014, 2017
Chile (CHL)		2005-2014
Ghana (GHA)		2006, 2008-2014
Greece (GRC)		2013, 2017
Indonesia (IDN)		2005-2014, 2017
Kenya (KEN)		2006-2014, 2017
Mexico (MEX)		2005-2014, 2017
Nigeria (NGA)		2006-2014, 2017
Peru (PER)		2011-2014, 2017
Spain (ESP)		2005-2006, 2008-2014, 2017
Turkey (TUR)		2005-2011, 2013-2014, 2017

Note: In following analysis we exclude the European Union and North Korea.

Table 2: Summary statistics for calibration results

Symbols	(Mean) Value	Description	Data/Calibration
σ	4	Elasticity of Substitution	Arkolakis et al. (2018)
θ	4.5	Distribution shape parameter	Arkolakis et al. (2018)
ρ	0.55	Distribution correlation parameter	Arkolakis et al. (2018)
$X_{i\ell n}$	610.458	Trilateral trade flows	Calibrated using (19)
$\frac{X_{\ell n}^{trade}}{\sum_{\ell} X_{\ell n}^{trade}}$	0.003 (0.003)	Model-driven trade share	Calibrated using actual trade share
$\frac{\tilde{X}_{\ell n}^{trade}}{X_n}$	0.003 (0.003)	Actual trade share	COW and WTO-UNCTAD-ITC
$\frac{X_{i\ell}^{fdi}}{\sum_i X_{i\ell}^{fdi}}$	0.001 (0.003)	Model-driven FDI share	Calibrated using actual FDI share
$\frac{\tilde{X}_{i\ell}^{fdi}}{\sum_i \tilde{X}_{i\ell}^{fdi}}$	0.001 (0.003)	Actual FDI share	UNCTAD and CDIS
$\tau_{\ell n}$	5.630 (1.410)	Trade costs	Calibrated using (21)
$\eta_{i\ell}^{\frac{1}{1-\sigma}}\gamma_{i\ell}$	10.285 (1.816)	Expectation-adjusted FDI costs	Calibrated using (21)

Note:These results are based on data from 2009. Parameter values for bilateral variables such as trade share, FDI share, trade costs and FDI costs are mean values with out internal variables. Standard deviations are in parentheses.

Table 3: OLS/PPML estimation results for FDI stocks

	OLS	OLS	OLS	OLS	OLS	PPML	PPML	PPML	PPML	PPML
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
$PS_{i\ell,t}$	1.955***	1.985***	1.982***	1.981***		0.671	1.138***	1.142***	1.145***	
	(0.720)	(0.672)	(0.667)	(0.670)		(0.440)	(0.279)	(0.277)	(0.280)	
$\Delta PS_{i\ell,t}$					1.809***					1.047***
					(0.591)					(0.261)
$PS_{i\ell,t-1}$					2.215***					1.559***
					(0.790)					(0.337)
$LogDist_{i\ell}$	-0.681**	-0.595**	-0.588**	-0.580**	-0.565**	0.088	-0.063	-0.033	-0.065	-0.047
	(0.278)	(0.247)	(0.247)	(0.250)	(0.259)	(0.225)	(0.157)	(0.171)	(0.176)	(0.157)
$GenDist_{i\ell}$	-1.372	-1.512	-1.620	-1.633	-2.026	-6.655**	-7.939***	-8.522***	-8.230***	-8.244***
	(2.649)	(2.631)	(2.644)	(2.629)	(2.644)	(2.941)	(2.194)	(2.246)	(2.172)	(2.169)
$ComRegion_{i\ell}$	0.752*	0.864**	0.866**	0.871**	0.868**	0.610**	0.499*	0.491*	0.474*	0.509*
	(0.405)	(0.403)	(0.401)	(0.400)	(0.414)	(0.268)	(0.275)	(0.276)	(0.284)	(0.273)
$ComCol_{i\ell}$	-1.342*	-1.264*	-1.271*	-1.238	-1.167	-0.121	0.236	0.237	0.239	-1.586***
	(0.751)	(0.754)	(0.748)	(0.755)	(0.790)	(0.873)	(0.821)	(0.838)	(0.843)	(0.473)
$ComLeg_{i\ell}$	0.510**	0.566***	0.564***	0.560***	0.571***	0.584***	0.471***	0.466***	0.469***	0.444***
	(0.204)	(0.186)	(0.184)	(0.185)	(0.190)	(0.170)	(0.124)	(0.127)	(0.126)	(0.126)
$ComPol_{i\ell,t}$	0.589	0.496	0.494	0.493	0.431	0.133	0.139	0.127	0.156	0.074
	(0.375)	(0.412)	(0.411)	(0.410)	(0.433)	(0.488)	(0.485)	(0.516)	(0.504)	(0.484)
$LogBiExrate_{i\ell,t}$	0.301**	0.279**	0.271**	0.272**	0.277**	0.326**	0.261**	0.289**	0.284**	0.263**
	(0.138)	(0.131)	(0.132)	(0.132)	(0.131)	(0.139)	(0.125)	(0.128)	(0.122)	(0.119)
$RTA_{i\ell,t}$	0.167	0.069	0.035	0.017	0.099	0.598***	0.388*	0.372	0.471*	0.390*
	(0.257)	(0.250)	(0.289)	(0.293)	(0.251)	(0.229)	(0.210)	(0.247)	(0.265)	(0.202)
$DiffTax_{i\ell,t}$	0.060	0.162	0.113	0.126	0.089	-0.910	-1.735***	-1.599***	-1.645***	-1.516**
	(2.246)	(2.167)	(2.162)	(2.158)	(2.225)	(0.668)	(0.607)	(0.596)	(0.602)	(0.603)
$LogPoldist_{i\ell,t}$	0.001	0.023	0.019	0.015	0.030	0.566	0.023	0.001	0.024	0.012
	(0.323)	(0.237)	(0.245)	(0.243)	(0.251)	(0.370)	(0.282)	(0.293)	(0.283)	(0.283)
$BIT_{i\ell,t}$	0.784***	0.805***	0.803***	0.807***	0.848***	0.441**	0.526**	0.523**	0.511**	0.566***
	(0.216)	(0.210)	(0.211)	(0.210)	(0.222)	(0.173)	(0.211)	(0.214)	(0.212)	(0.207)
$ISI_{i\ell,t}$	0.393	0.377	0.375	0.394	0.296	0.902	1.251**	1.238**	1.159*	1.217*
	(0.832)	(0.686)	(0.688)	(0.692)	(0.711)	(0.765)	(0.631)	(0.593)	(0.628)	(0.628)
$NTM_{i\ell,t}$	8.912	12.007**	12.142**	12.207**	11.284*	0.346	0.386	0.218	0.186	-0.104
	(6.958)	(6.082)	(6.098)	(6.110)	(6.091)	(1.425)	(1.469)	(1.480)	(1.474)	(1.534)
$LogTariff^{wa}_{i\ell,t}$	-0.862	-0.907			-1.041	2.978**	2.183			2.126
	(2.283)	(2.311)			(2.305)	(1.368)	(1.446)			(1.486)
$Alliance_{i\ell,t}$	0.275					0.413*				

	(0.351)					(0.216)				
$ComCur_{i\ell,t}$	0.034					0.080				
	(0.517)					(0.292)				
$ComLang_{i\ell}$	0.375					-0.247				
	(0.334)					(0.227)				
$Exheg_{i\ell}$	-0.093					0.200				
	(0.370)					(0.198)				
$Imheg_{i\ell}$	0.143					0.339				
	(0.409)					(0.225)				
$ComDev_{i\ell}$	-0.063					0.361				
	(0.321)					(0.362)				
$Contig_{i\ell}$	-0.544					0.085				
	(0.517)					(0.234)				
$MID_{i\ell}$	-0.003					0.002				
	(0.005)					(0.003)				
$LogTariff^{sa}_{i\ell,t}$			-1.701					-0.719		
			(5.040)					(5.892)		
$LogTariff^{la}_{i\ell,t}$				-2.056					2.049	
				(4.438)					(4.291)	
$Constant$	10.270***	9.497***	9.533***	9.523***	9.196***	9.022***	11.397***	11.265***	11.312***	11.250***
	(2.545)	(2.138)	(2.151)	(2.144)	(2.248)	(2.380)	(1.548)	(1.548)	(1.574)	(1.568)
Source-Year FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Host-Year FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
N	1795	1795	1795	1795	1512	2272	2272	2272	2272	1887
R^2	0.853	0.851	0.851	0.851	0.858					
Pseudo R^2						0.966	0.964	0.964	0.964	0.965

Note: i refers to the country of source and ℓ refers to the country of host. The dependent variable for OLS is the logarithm of bilateral FDI stocks. The standard errors are clustered at the country-pair level. *, ** and *** indicates statistic significance at the 10%, 5% and 1%, respectively.

Table 4: OLS/PPML estimation results with further fixed effect controls and clustering

	OLS (1)	OLS (2)	OLS (3)	OLS (4)	OLS (5)	PPML (6)	PPML (7)	PPML (8)	PPML (9)	PPML (10)
$PS_{i\ell,t}$	1.985***	2.174***	1.985***	1.985***	2.174***	1.138***	0.958***	1.138***	1.138***	0.958***
	(0.672)	(0.682)	(0.643)	(0.684)	(0.681)	(0.279)	(0.314)	(0.292)	(0.303)	(0.348)
Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Source-Year FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Host-Year FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Dev-Dev FE		Y			Y		Y			Y
OE-OE FE		Y			Y		Y			Y
EU-EU FE		Y			Y		Y			Y
G20-G20 FE		Y			Y		Y			Y
Country-pair clusters	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Source-Year clusters			Y	Y	Y			Y	Y	Y
Host-year clusters				Y	Y				Y	Y
N	1795	1795	1795	1795	1795	2272	2272	2272	2272	2272
R^2	0.851	0.857	0.851	0.851	0.857					
Pseudo R^2						0.964	0.965	0.964	0.964	0.965

Note: The Dev-Dev FE is defined by the combination of development stages of the country pair, where the development stages are industrialized versus non-industrialized. For example, the Dev-Dev FE consists of four fixed effects: industrialized to industrialized, non-industrialized to non-industrialized, industrialized to non-industrialized and non-industrialized to industrialized. The OE-OE FE is defined by the combination of OECD members of the country pair. The EU-EU FE is defined by the combination of European Union members of the country pair. The G20-G20 FE is defined by the combination of Group of 20 members of the country pair.

Table 5: IV regression

	ii'-based IVs			$\ell\ell'$-based IVs			ii' and $\ell\ell'$-based IVs		
	GMM	1st-Stage	PPML	GMM	1st-Stage	PPML	GMM	1st-Stage	PPML
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$PS_{i\ell,t}$	3.741**		2.020***	1.846**		0.928**	2.011**		1.254***
	(1.702)		(0.716)	(0.825)		(0.405)	(0.813)		(0.374)
$LogDist_{i\ell}$	-0.612**	0.007	-0.039	-0.594**	0.011	-0.041	-0.587**	0.010	-0.071
	(0.244)	(0.015)	(0.133)	(0.247)	(0.012)	(0.139)	(0.247)	(0.010)	(0.140)
$GenDist_{i\ell}$	-1.357	-0.238	-8.187***	-1.524	-0.054	-8.293***	-1.390	-0.087	-7.796***
	(2.582)	(0.191)	(1.967)	(2.640)	(0.153)	(1.926)	(2.629)	(0.136)	(1.931)
$ComRegion_{i\ell}$	0.821**	0.011	0.532**	0.868**	0.034**	0.525**	0.899**	0.029*	0.491**
	(0.400)	(0.022)	(0.216)	(0.404)	(0.017)	(0.224)	(0.403)	(0.015)	(0.221)
$ComCol_{i\ell}$	-1.163	-0.014	0.274	-1.272*	-0.074***	0.264	-1.316*	-0.050*	0.219
	(0.828)	(0.031)	(0.808)	(0.748)	(0.028)	(0.806)	(0.739)	(0.026)	(0.796)
$ComLeg_{i\ell}$	0.506***	-0.015	0.435***	0.570***	0.022**	0.475***	0.543***	-0.009	0.469***
	(0.184)	(0.017)	(0.117)	(0.187)	(0.011)	(0.126)	(0.185)	(0.012)	(0.123)
$ComPol_{i\ell,t}$	0.467	0.024	0.191	0.498	-0.002	0.171	0.591	0.011	0.128
	(0.405)	(0.026)	(0.454)	(0.413)	(0.025)	(0.474)	(0.402)	(0.022)	(0.475)
$LogBiExrate_{i\ell,t}$	0.284**	-0.007	0.276**	0.279**	0.002	0.261**	0.275**	0.002	0.262**
	(0.134)	(0.007)	(0.121)	(0.131)	(0.005)	(0.126)	(0.131)	(0.005)	(0.125)
$RTA_{i\ell,t}$	0.025	0.012	0.388**	0.072	-0.008	0.390**	0.108	-0.007	0.388**
	(0.258)	(0.016)	(0.164)	(0.249)	(0.012)	(0.167)	(0.247)	(0.012)	(0.168)
$DiffTax_{i\ell,t}$	0.315	-0.027	-1.745***	0.150	-0.040	-1.730***	0.008	-0.027	-1.745***
	(2.150)	(0.126)	(0.644)	(2.168)	(0.094)	(0.650)	(2.158)	(0.092)	(0.645)
$LogPoldist_{i\ell,t}$	0.145	-0.053***	0.074	0.013	-0.016	0.027	0.018	-0.018*	0.020
	(0.249)	(0.012)	(0.252)	(0.235)	(0.010)	(0.248)	(0.234)	(0.009)	(0.239)
$BIT_{i\ell,t}$	0.803***	0.006	0.546***	0.805***	0.020**	0.529***	0.807***	0.019**	0.528***
	(0.215)	(0.013)	(0.156)	(0.209)	(0.010)	(0.163)	(0.209)	(0.009)	(0.160)
$ISI_{i\ell,t}$	0.417	0.008	1.208**	0.374	-0.040	1.261**	0.368	-0.035	1.241**
	(0.692)	(0.053)	(0.541)	(0.684)	(0.037)	(0.584)	(0.682)	(0.037)	(0.561)
$NTM_{i\ell,t}$	9.550	0.798	-0.442	12.203**	-0.958	0.314	12.900**	-0.865	0.433
	(6.767)	(0.786)	(2.159)	(5.944)	(1.187)	(1.904)	(5.968)	(1.136)	(1.889)
$LogTariff^{wa}_{i\ell,t}$	-0.528	-0.182**	2.532	-0.937	-0.056	2.189	-0.594	-0.082	2.209
	(2.250)	(0.079)	(1.635)	(2.313)	(0.054)	(1.627)	(2.396)	(0.052)	(1.577)
$PS^{ComLang,c}_{i'\ell,t}$		-2.652***						-1.575***	
		(0.354)						(0.240)	
$PS^{Contig,c}_{i\ell',t}$					-4.757***			-4.318***	
					(0.298)			(0.289)	
Source-Year FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Host-Year FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
1st stage F-statistic		39.848			24.912			50.620	
Hansen J statistic							1.605		
$\chi^2 p-$value							0.2051		
N	1795	2283	2272	1795	2283	2272	1795	2283	2272
R-sq	0.274	0.766		0.274	0.853		0.274	0.868	
Pseudo R^2			0.964			0.964			0.964

Note: The stata command *ivreghdfe* and *ivregress* are used to estimate results of IV GMM and First-Stage, respectively. To avoid the incidental parameter problem, we use the control function method to estimate IV PPML (Papke,2008). Bootstrap sampling (500 times) is used to adjust standard errors in the second stage regression.

Table 6: Difference GMM

	(1)	(2)	(3)	(4)
$Logfdi^{value}_{i\ell,t}$	0.286***	0.293***	0.276***	0.277***
	(2.814)	(2.828)	(2.653)	(2.655)
$\Delta PS_{i\ell,t}$	5.259**	5.846**	4.629*	4.729*
	(2.066)	(2.091)	(1.864)	(1.893)
$PS_{i\ell,t-1}$	5.650**	5.816**	4.658*	4.609*
	(2.290)	(2.113)	(1.948)	(1.902)
$LogBiExrate_{i\ell,t}$	0.157	0.332	0.168	0.162
	(0.182)	(0.387)	(0.206)	(0.198)
$DiffTax_{i\ell,t}$	7.362*	7.032*	7.214*	7.246*
	(1.735)	(1.725)	(1.771)	(1.779)
$LogPoldist_{i\ell,t}$	0.383	0.385	0.377	0.373
	(1.376)	(1.298)	(1.326)	(1.301)
$RTA_{i\ell,t}$	0.029	0.044	0.044	0.033
	(0.163)	(0.247)	(0.264)	(0.201)
$BIT_{i\ell,t}$	0.079	0.084	0.052	0.050
	(0.322)	(0.323)	(0.222)	(0.210)
$ISI_{i\ell,t}$	-5.726*	-5.687	-5.506*	-5.604*
	(-1.678)	(-1.642)	(-1.667)	(-1.683)
$LogTariff^{wa}_{i\ell,t}$	0.671	0.479	0.541	0.528
	(0.666)	(0.442)	(0.542)	(0.522)
$NTM_{i\ell,t}$	-2.656	-4.622	-2.551	-2.801
	(-0.429)	(-0.713)	(-0.416)	(-0.454)
Source-Year FE	YES	YES	YES	YES
Host-year FE	YES	YES	YES	YES
Lags included in the IVs	1	2	3	4
AR(1): z-statistic	-3.718	-3.739	-3.826	-3.854
AR(1): p-value	0.000	0.000	0.000	0.000
AR(2): z-statistic	0.171	0.272	0.156	0.178
AR(2): p-value	0.865	0.786	0.876	0.859
Hansen test: χ^2	16.469	9.097	10.695	11.837
Hansen test: p-value	0.058	0.613	0.636	0.691
N	1127	1127	1127	1127

Note: The stata command *xtabond2* is used to estimate the dynamic model. For dependent variables, 1-10 order lagged logarithm of bilateral FDI stocks are used as IVs.

Table 7: System GMM

	(1)	(2)	(3)	(4)
$Logfdi^{value}_{i\ell,t}$	0.528***	0.519***	0.519***	0.520***
	(4.390)	(4.401)	(4.390)	(4.403)
$\Delta PS_{i\ell,t}$	6.785***	6.449**	6.183**	6.316***
	(2.658)	(2.568)	(2.536)	(2.592)
$PS_{i\ell,t-1}$	4.523**	4.219**	4.127**	4.234**
	(2.358)	(2.238)	(2.243)	(2.305)
$LogBiExrate_{i\ell,t}$	0.021	0.021	0.021	0.022
	(0.313)	(0.312)	(0.324)	(0.328)
$DiffTax_{i\ell,t}$	1.800	1.781	1.780	1.790
	(1.391)	(1.371)	(1.374)	(1.377)
$LogPoldist_{i\ell,t}$	0.319*	0.297*	0.289	0.297*
	(1.796)	(1.661)	(1.640)	(1.693)
$RTA_{i\ell,t}$	0.159	0.176	0.180	0.175
	(1.014)	(1.136)	(1.163)	(1.137)
$BIT_{i\ell,t}$	0.380**	0.388**	0.388**	0.387**
	(2.327)	(2.409)	(2.415)	(2.405)
$ISI_{i\ell,t}$	0.851*	0.865*	0.863*	0.862*
	(1.870)	(1.930)	(1.935)	(1.921)
$LogTariff^{wa}_{i\ell,t}$	-0.928	-1.037	-1.062	-1.032
	(-1.030)	(-1.161)	(-1.189)	(-1.167)
$NTM_{i\ell,t}$	-8.169**	-7.774*	-7.605*	-7.756*
	(-2.000)	(-1.905)	(-1.897)	(-1.940)
Source-Year FE	YES	YES	YES	YES
Host-year FE	YES	YES	YES	YES
Lags included in the IVs	1	2	3	4
AR(1): z-statistic	-4.461	-4.428	-4.458	-4.447
AR(1): p-value	0.000	0.000	0.000	0.000
AR(2): z-statistic	1.222	1.168	1.152	1.178
AR(2): p-value	0.222	0.243	0.249	0.239
Sargan test: χ^2	16.913	18.440	19.828	20.188
Sargan test: p-value	0.659	0.680	0.706	0.783
N	1441	1441	1441	1441

Note: The stata command *xtabond2* is used to estimate the dynamic model. For dependent variables, 1-10 order lagged logarithm of bilateral FDI stocks are used as IVs. Due to large numbers of IVs, the hansen test is weaken to equal to 1, thus we report the Sargan test alternatively.

Table 8: Country image shifts of the U.S. and China

	The Bush Effects			The China Rising Effects		
	PS_{2011}	PS_{2007}	ΔPS	PS_{2009}	PS_{2012}	ΔPS
Brazil (BRA)	0.64	0.29	-0.35		0.48	
Canada (CAN)	0.4	0.34	-0.06	0.31	0.53	0.22
China (CHN)	0.33	0.28	-0.05			
France (FRA)	0.46	0.24	-0.22	0.22	0.38	0.16
Germany (DEU)	0.37	0.16	-0.21	0.11	0.42	0.31
India (IND)	0.42	0.3	-0.12	0.3	0.3	0
Japan (JPN)	0.36			0.08	0.1	0.02
Pakistan (PAK)	0.16				0.76	
Russia (RUS)	0.38	0.19	-0.19	0.45	0.46	0.01
South Korea (KOR)	0.74	0.35	-0.39		0.33	
Britain (GBR)	0.46	0.33	-0.13	0.39	0.57	0.18
United States (USA)				0.32	0.42	0.1
Australia (AUS)	0.45	0.29	-0.16	0.47	0.61	0.14
Chile (CHL)	0.62	0.32	-0.3	0.6	0.53	-0.07
Ghana (GHA)	0.84			0.75	0.64	-0.11
Greece (GRC)						
Indonesia (IDN)	0.58	0.21	-0.37	0.43	0.51	0.08
Kenya (KEN)	0.68	0.7	0.02	0.74	0.75	0.01
Mexico (MEX)	0.23	0.12	-0.11	0.34	0.37	0.03
Nigeria (NGA)	0.76	0.72	-0.04	0.72	0.89	0.17
Peru (PER)	0.53				0.5	
Spain (ESP)	0.41			0.29	0.39	0.1
Turkey (TUR)	0.35	0.07	-0.28	0.18		
Mean			-0.185			0.084
Median			-0.175			0.09

Table 9: The George W. Bush effects ($PS_{i,US,2011} \rightarrow PS_{i,US,2007}$)

	Scenario 1						Scenario 2					
%	W_n	$\lambda_{nn}^{-\frac{1}{\theta}}$	$\psi_{nnn}^{-\frac{1-\rho}{\theta}}$	$\left(\frac{Y_n^f}{X_n}\right)^{\frac{1}{\theta}}$	GO_n	$\frac{W_n}{GO_n}$	W_n	$\lambda_{nn}^{-\frac{1}{\theta}}$	$\psi_{nnn}^{-\frac{1-\rho}{\theta}}$	$\left(\frac{Y_n^f}{X_n}\right)^{\frac{1}{\theta}}$	GO_n	$\frac{W_n}{GO_n}$
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
U.S.	-0.064	-0.139	0.000	0.075	2.724	2.339	-0.052	-0.331	0.000	0.280	2.724	1.924
Australia	-0.107	0.009	0.000	-0.115	3.799	2.803	-0.101	0.003	0.000	-0.104	3.799	2.660
Brazil	-0.069	0.055	0.000	-0.124	1.730	4.013	-0.067	0.044	0.000	-0.111	1.730	3.896
Canada	-0.201	0.141	0.000	-0.342	6.051	3.328	-0.192	0.154	0.000	-0.345	6.051	3.168
Chile	0.060	-0.101	0.000	0.161	5.056	1.182	0.067	-0.101	0.000	0.168	5.056	1.323
China	0.038	-0.025	0.000	0.063	1.689	2.239	0.038	-0.026	0.000	0.064	1.689	2.240
Germany	-0.083	-0.036	0.000	-0.046	6.398	1.293	-0.080	-0.058	0.000	-0.022	6.398	1.247
France	-0.226	0.052	0.000	-0.277	5.722	3.941	-0.214	0.029	0.000	-0.243	5.722	3.733
Britain	-0.362	0.099	0.000	-0.460	7.155	5.057	-0.354	0.080	0.000	-0.434	7.155	4.949
Indonesia	0.087	-0.075	0.000	0.161	2.172	3.986	0.088	-0.075	0.000	0.163	2.172	4.032
India	-0.076	0.090	0.000	-0.166	2.249	3.393	-0.077	0.088	0.000	-0.165	2.249	3.423
Kenya	-0.471	0.364	0.000	-0.832	2.879	16.360	-0.471	0.361	0.000	-0.830	2.879	16.374
Korea	-0.057	0.027	0.000	-0.083	4.384	1.292	-0.055	0.026	0.000	-0.081	4.384	1.248
Mexico	0.009	0.033	0.000	-0.024	5.090	0.168	0.016	0.042	0.000	-0.026	5.090	0.311
Nigeria	0.172	-0.135	0.000	0.308	1.941	8.886	0.172	-0.140	0.000	0.313	1.941	8.876
Russia	0.101	-0.107	0.000	0.208	2.083	4.853	0.103	-0.110	0.000	0.213	2.083	4.930
Turkey	-0.244	0.203	0.000	-0.446	2.925	8.341	-0.243	0.198	0.000	-0.441	2.925	8.318
Mean	-0.033	0.007	0.000	-0.040	5.698	2.895	-0.080	0.014	0.000	-0.093	5.698	3.126

Note: In Scenario 1, source countries not included in the BBC WSP as evaluating countries are assumed not to have changed their perceptions towards the evaluated host country, i.e., USA. In Scenario 2, these countries are assumed to take on the mean change in the views towards the evaluated host country. W_n refers to welfare changes. $\lambda_{nn}^{-\frac{1}{\theta}}$ refers to foreign technologies effects. $\psi_{nnn}^{-\frac{1-\rho}{\theta}}$ refers to offshoring effects. $\left(\frac{Y_n^f}{X_n}\right)^{\frac{1}{\theta}}$ refers to effects of specialization in innovation. GO_n is gains from openness and $\frac{W_n}{GO_n}$ measures the significance of welfare changes incurred by shifts of country image. Mean values are calculated across all samples.

Table 10: Bilateral FDI and trade effects from the Bush effects ($PS_{i,USA,2011} \rightarrow PS_{i,USA,2007}$)

	Scenario 1		Scenario 2	
	To U.S.		To U.S.	
%	FDI	$Trade$	FDI	$Trade$
	(1)	(2)	(3)	(4)
U.S.	1.214	-0.680	2.346	-1.000
Australia	-41.796	45.714	-41.551	44.724
Brazil	-83.431	3.537	-83.329	3.200
Canada	-24.330	2.995	-24.233	2.974
Chile	-79.703	6.719	-79.592	6.384
China	-26.127	5.468	-25.667	5.015
Germany	-56.495	43.373	-56.207	42.516
France	-54.457	53.262	-54.172	52.252
Britain	-35.261	37.593	-34.969	36.817
Indonesia	-86.507	8.594	-86.411	8.056
India	-45.914	1.659	-45.565	1.186
Kenya	24.633	-13.926	25.478	-14.320
Korea	-86.054	16.390	-85.969	15.899
Mexico	-43.529	1.897	-43.458	1.886
Nigeria	-24.863	10.530	-24.437	10.130
Russia	-62.895	17.006	-62.637	16.397
Turkey	-75.902	-3.098	-75.729	-3.563
Total	-22.257	12.101	-44.425	16.503

Note: Rows represent exporters of bilateral trade or source countries of bilateral FDI. The change in bilateral FDI measures the change in the share of FDI from source countries in U.S.'s total inward FDI. The change in bilateral trade volume measures the change in the share of trade flows from exporting countries in U.S.'s total imports. In Scenario 1, source countries not included in the BBC WSP as evaluating countries are assumed not to have changed their perceptions towards the evaluated host country, i.e., USA. In Scenario 2, these countries are assumed to take on the mean change in the views towards the evaluated host country. Total values are calculated across all samples.

Table 11: The China Rising effects ($PS_{i,CHN,2009} \rightarrow PS_{i,CHN,2012}$)

	Scenario 1						Scenario 2					
%	W_n	$\lambda_{nn}^{-\frac{1}{\theta}}$	$\psi_{nnn}^{-\frac{1-\rho}{\theta}}$	$\left(\frac{Y_n^f}{X_n}\right)^{\frac{1}{\theta}}$	GO_n	$\frac{W_n}{GO_n}$	W_n	$\lambda_{nn}^{-\frac{1}{\theta}}$	$\psi_{nnn}^{-\frac{1-\rho}{\theta}}$	$\left(\frac{Y_n^f}{X_n}\right)^{\frac{1}{\theta}}$	GO_n	$\frac{W_n}{GO_n}$
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
China	0.019	0.054	0.000	-0.035	1.638	1.174	0.014	0.082	0.000	-0.068	1.638	0.878
Australia	0.001	0.000	0.000	0.001	3.587	0.021	0.001	0.000	0.000	0.001	3.587	0.024
Canada	0.004	0.022	0.000	-0.019	5.862	0.062	0.003	0.023	0.000	-0.019	5.862	0.057
Chile	0.030	-0.050	0.000	0.080	4.295	0.688	0.030	-0.049	0.000	0.079	4.295	0.699
Germany	0.109	-0.067	0.000	0.175	5.796	1.873	0.108	-0.066	0.000	0.174	5.796	1.870
Spain	-0.057	0.059	0.000	-0.115	4.108	1.383	-0.057	0.059	0.000	-0.116	4.108	1.384
France	0.011	-0.004	0.000	0.015	5.152	0.217	0.011	-0.003	0.000	0.014	5.152	0.210
Britain	0.016	0.013	0.000	0.003	6.474	0.241	0.015	0.014	0.000	0.001	6.474	0.228
Ghana	-0.394	0.313	0.000	-0.705	2.919	13.500	-0.395	0.313	0.000	-0.706	2.919	13.515
Indonesia	0.057	-0.045	0.000	0.102	2.158	2.653	0.057	-0.045	0.000	0.102	2.158	2.647
Japan	0.021	-0.017	0.000	0.039	2.129	1.004	0.021	-0.017	0.000	0.038	2.129	0.996
Kenya	-0.289	0.216	0.000	-0.505	2.067	13.997	-0.289	0.217	0.000	-0.505	2.067	13.989
Mexico	-0.016	0.036	0.000	-0.052	4.605	0.358	-0.017	0.036	0.000	-0.052	4.605	0.360
Nigeria	0.100	-0.075	0.000	0.176	2.997	3.352	0.100	-0.075	0.000	0.176	2.997	3.341
Russia	0.063	-0.062	0.000	0.126	2.399	2.644	0.063	-0.062	0.000	0.126	2.399	2.637
U.S.	-0.020	0.023	0.000	-0.043	2.248	0.880	-0.020	0.023	0.000	-0.043	2.248	0.896
Mean	-0.022	0.020	0.000	-0.042	5.171	2.012	-0.015	0.019	0.000	-0.034	5.171	2.151

Note: In Scenario 1, source countries not included in the BBC WSP as evaluating countries are assumed not to have changed their perceptions towards the evaluated host country, i.e., CHN. In Scenario 2, these countries are assumed to take on the mean change in the views towards the evaluated host country. W_n refers to welfare changes. $\lambda_{nn}^{-\frac{1}{\theta}}$ refers to foreign technologies effects. $\psi_{nnn}^{-\frac{1-\rho}{\theta}}$ refers to offshoring effects. $\left(\frac{Y_n^f}{X_n}\right)^{\frac{1}{\theta}}$ refers to effects of specialization on innovation. GO_n is gains from openness and $\frac{W_n}{GO_n}$ measures the significance of welfare changes incurred by shifts of country image. Mean values are calculated across all samples.

Table 12: Bilateral FDI and trade effects from the China Rising effects ($PS_{i,CHN,2009} \rightarrow PS_{i,CHN,2012}$)

	Scenario 1		Scenario 2	
	To China		To China	
%	FDI	$Trade$	FDI	$Trade$
	(1)	(2)	(3)	(4)
China	-0.501	0.298	-0.680	0.365
Australia	106.854	-2.028	106.379	-1.819
Canada	175.693	-17.571	175.252	-17.325
Chile	-30.770	0.189	-30.930	0.390
Germany	318.137	-18.123	317.371	-17.858
Spain	67.958	-5.975	67.534	-5.721
France	109.001	-11.706	108.582	-11.417
Britain	106.072	-22.247	105.785	-21.949
Ghana	-37.267	-14.206	-37.435	-14.011
Indonesia	46.799	-0.346	46.455	-0.092
Japan	9.265	-0.661	9.060	-0.419
Kenya	20.382	-14.924	20.040	-14.706
Mexico	19.649	-2.687	19.355	-2.479
Nigeria	135.478	-1.819	134.908	-1.569
Russia	4.030	1.664	3.753	1.898
U.S.	61.665	-9.043	61.364	-8.793
Total	48.760	-3.248	66.033	-4.034

Note: Rows represent exporters of bilateral trade or source countries of bilateral FDI. The change in bilateral FDI measures the change in the share of FDI from source countries in China's total inward FDI. The change in bilateral trade volume measures the change in the share of trade flows from exporting countries in China's total imports. In Scenario 1, source countries not included in the BBC WSP as evaluating countries are assumed not to have changed their perceptions towards the evaluated host country, i.e., CHN. In Scenario 2, these countries are assumed to take on the mean change in the views towards the evaluated host country. Total values are calculated across all samples.

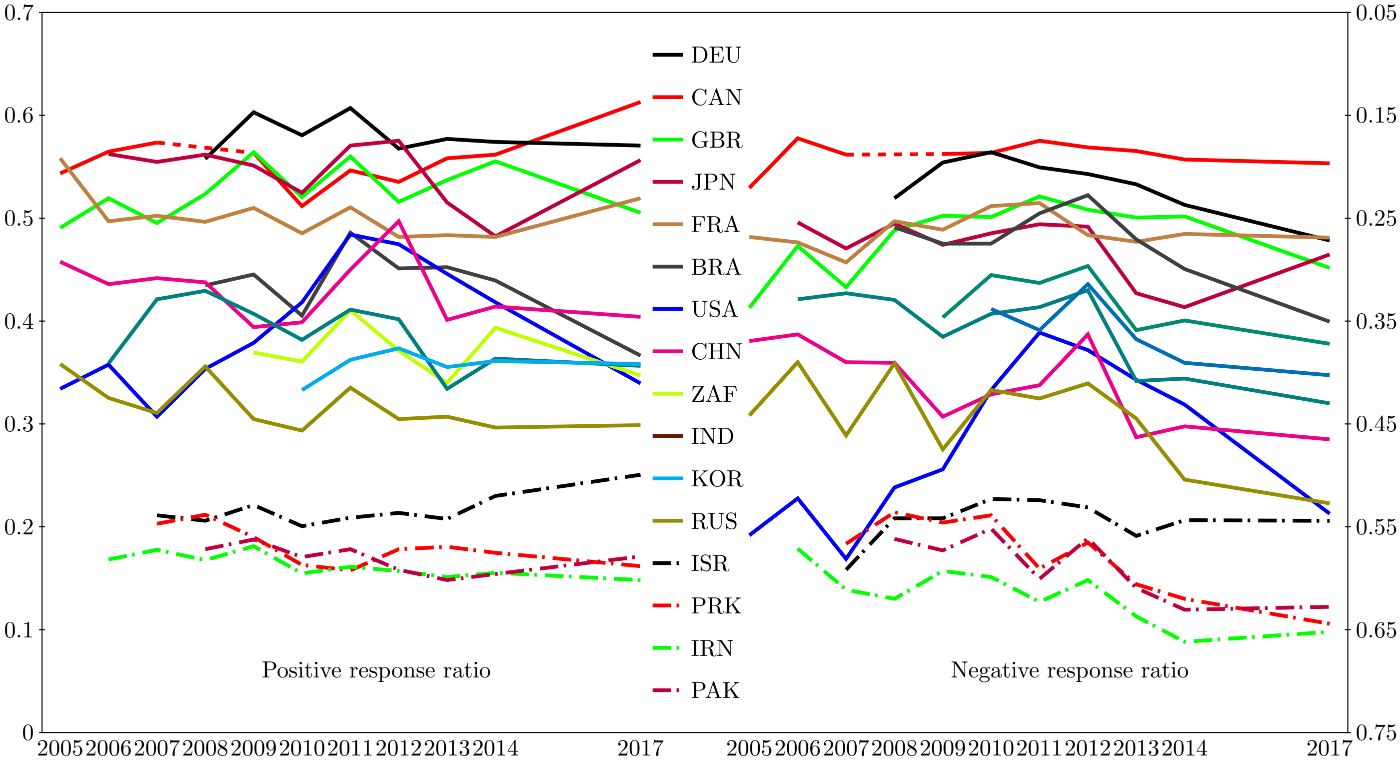

Figure 1: Average positive response ratio $\overline{PS}_{\ell \cdot t}$ and average negative response ratio $\overline{NG}_{\ell \cdot t}$.

Note: The data for Canada are missing in 2008, hence the dashed line between 2007 and 2009. The data for all countries are missing for 2015 and 2016. Average ratings exclude the target country's rating of itself.

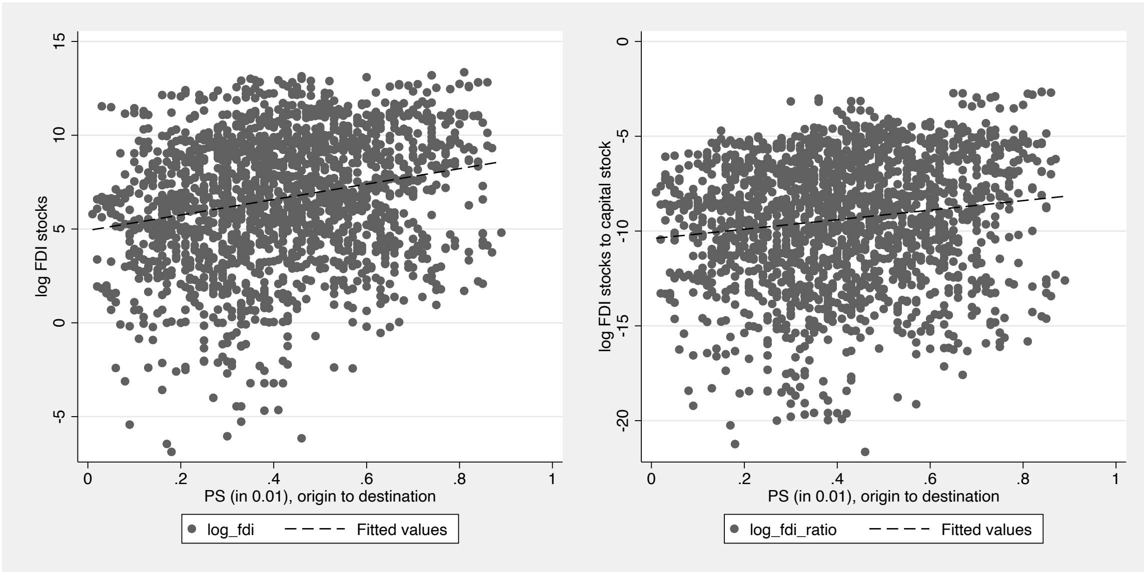

Figure 2: Correlations between $PS_{i\ell}$ and FDI stocks.

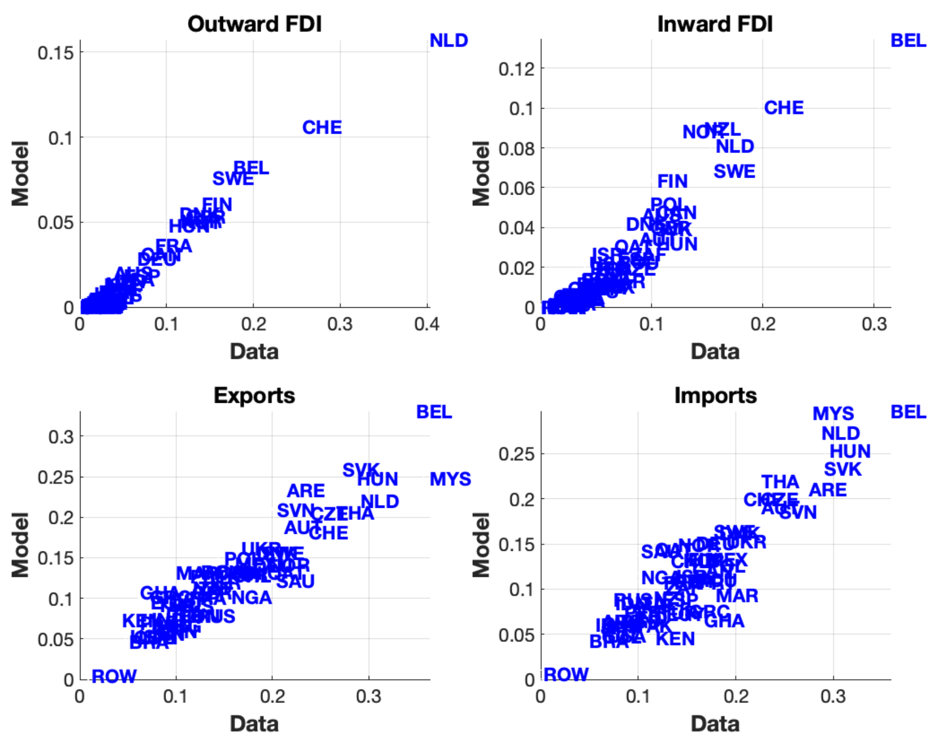

Figure 3: Aggregate trade and FDI stocks.

Note: Imports and exports for country n are normalized by actual total absorption X_n. Outward and inward FDI for country n are normalized by actual capital stocks.

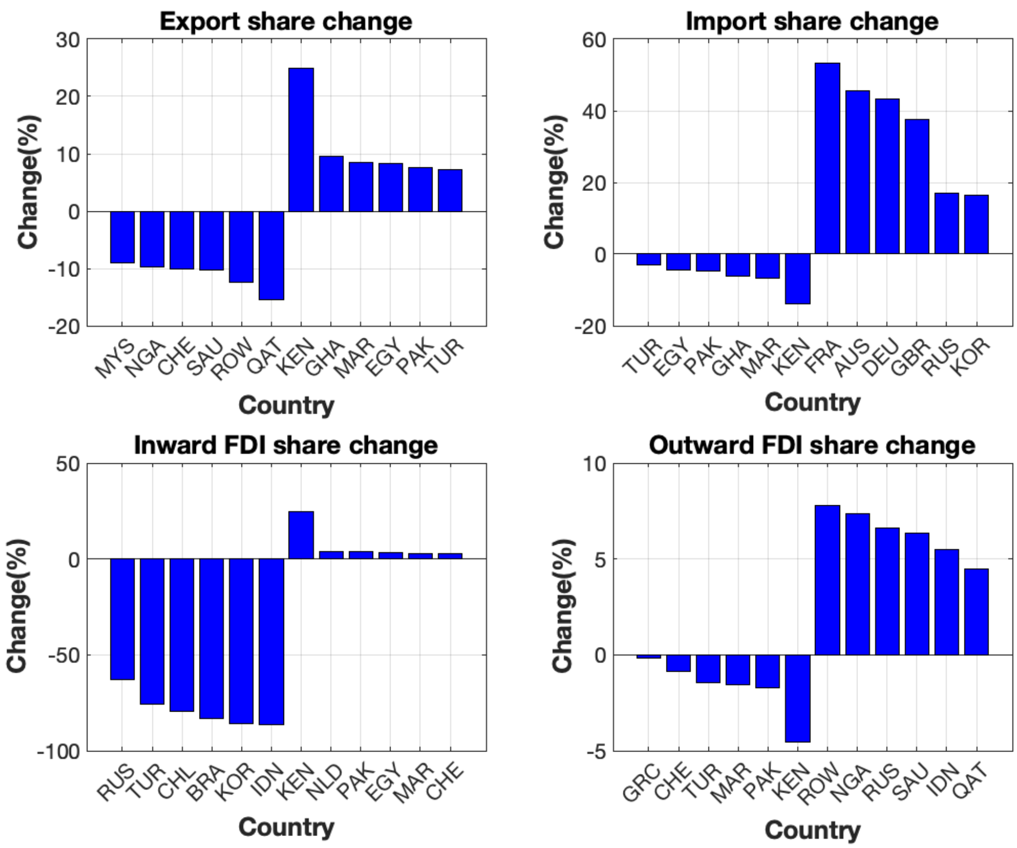

Figure 4: Bilateral share change after Bush effects.

Note: The figure is based on results from the scenario 1.

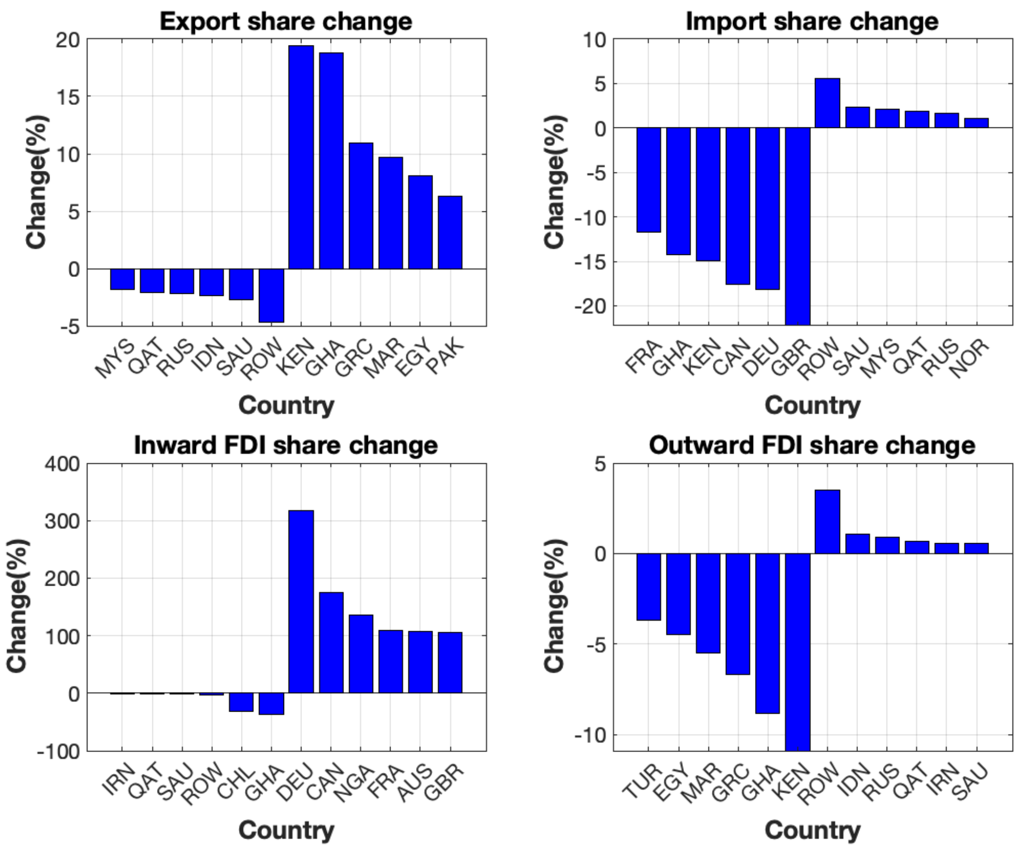

Figure 5: Bilateral share change after China rising effects.

Note: The figure is based on results from the scenario 1.

A Model Appendix

A.1 Derivation

1. Derivation of $\psi_{i\ell n}$ and Ψ_{in}

The unconditional probability that a firm from i will serve market n from ℓ is

$$\Pr\left(\arg\min_k C_{ikn}(\omega) = \ell \cap \min_k C_{ikn}(\omega) \leq c_n^*\right)$$

To compute this prob. , generally:

$$\Pr\left(c_{i1n}(\omega) \geq c_{i1n}, \ldots, c_{iNn}(\omega) \geq c_{iNn}\right) = \Pr\left(z_{i1n}(\omega) \leq \frac{\eta_{i1}^{\frac{1}{1-\sigma}}\xi_{i1n}}{c_{i1n}}, \ldots, z_{iNn}(\omega) \leq \frac{\eta_{iN}^{\frac{1}{1-\sigma}}\xi_{iNn}}{c_{iNn}}\right)$$

Assume that $c_{ikn} < \tilde{T}_i^{-1}\eta_{ik}^{\frac{1}{1-\sigma}}\xi_{ikn}$ for all k, then our assumption regarding the distribution of $z_{i\ell n}(\omega)$ for firms in country i implies that

$$\Pr\left(z_{i1n}(\omega) \leq \frac{\eta_{i1}^{\frac{1}{1-\sigma}}\xi_{i1n}}{c_{i1n}}, \ldots, z_{iNn} \leq \frac{\eta_{iN}^{\frac{1}{1-\sigma}}\xi_{iNn}}{c_{iNn}}\right) = 1 - T_i\left(\sum_{k=1}^{N} A_k \left(\frac{\eta_{ik}^{\frac{1}{1-\sigma}}\xi_{ikn}}{c_{ikn}}\right)^{\frac{-\theta}{1-\rho}}\right)^{1-\rho}. \tag{A.1}$$

From the property of multivariate distribution function, we know:

$$\Pr\left(c_{i1n}(\omega) \geq c_{i1n}, \ldots, c_{iln}(\omega) = c_{iln}, \ldots, c_{iNn}(\omega) \geq c_{iNn}\right) = -\frac{\partial \Pr\left(c_{i1n}(\omega) \geq c_{i1n}, \ldots, c_{iln}(\omega) \geq c_{iln}, \ldots, c_{iNn}(\omega) \geq c_{iNn}\right)}{\partial c_{iln}}$$

Thus from (A.1) we get:

$$\Pr\left(c_{i1n}(\omega) \geq c_{i1n}, \ldots, c_{iln}(\omega) = c_{iln}, \ldots, c_{iNn}(\omega) \geq c_{iNn}\right) = \theta T_i \left(\sum_{k=1}^{N} A_k \left(\frac{\eta_{ik}^{\frac{1}{1-\sigma}}\xi_{ikn}}{c_{ikn}}\right)^{-\frac{\theta}{1-\rho}}\right)^{-\rho} A_\ell(\eta_{i\ell}^{\frac{1}{1-\sigma}}\xi_{i\ell n})^{-\frac{\theta}{1-\rho}} c_{i\ell n}^{\frac{\theta}{1-\rho}-1}$$

Now we apply this for a certain costs $c < \eta_{il}^{\frac{1}{1-\sigma}}\xi_{i\ell n}\tilde{T}_i^{-1}$, for all ℓ :

$$\begin{aligned}
\Pr\left(\arg\min_k c_{ikn}(\omega) = \ell \cap \min_k c_{ikn}(\omega) = c\right) &= \Pr\left(c_{i1n}(\omega) \geq c, \ldots, c_{iln}(\omega) = c, \ldots, c_{iNn}(\omega) \geq c\right) \\
&= \theta T_i \left(\sum_{k=1}^{N} A_k(\eta_{ik}^{\frac{1}{1-\sigma}}\xi_{ikn})^{-\frac{\theta}{1-\rho}}\right)^{-\rho} A_\ell(\eta_{i\ell}^{\frac{1}{1-\sigma}}\xi_{i\ell n})^{-\frac{\theta}{1-\rho}} c^{\frac{-\theta\rho}{1-\rho}} c^{\frac{\theta}{1-\rho}-1} \\
&= T_i \left(\sum_{k=1}^{N} A_k(\eta_{ik}^{\frac{1}{1-\sigma}}\xi_{ikn})^{-\frac{\theta}{1-\rho}}\right)^{-\rho} A_\ell(\eta_{i\ell}^{\frac{1}{1-\sigma}}\xi_{i\ell n})^{-\frac{\theta}{1-\rho}} \theta c^{\theta-1}
\end{aligned} \tag{A.2}$$

Define $\psi_{i\ell n} = \frac{A_\ell(\eta_{i\ell}^{\frac{1}{1-\sigma}}\xi_{i\ell n})^{-\frac{\theta}{1-\rho}}}{\Psi_{in}^{\frac{1}{1-\rho}}}$ and $\Psi_{in} = \left[\sum_{\ell=1}^{N} A_\ell(\eta_{i\ell}^{\frac{1}{1-\sigma}}\xi_{i\ell n})^{-\frac{\theta}{1-\rho}}\right]^{1-\rho}$. We can integrate the previous expression (A.2) over c from 0 to c_n^* to show that the probability that firms from i serving market n will choose location ℓ for investment and production is

$$\begin{aligned}
\Pr\left(\arg\min_k c_{ikn}(\omega) = \ell \cap \min_k c_{ikn}(\omega) \le c_n^*\right) &= T_i\left(\sum_{k=1}^{N} A_k(\eta_{ik}^{\frac{1}{1-\sigma}}\xi_{ikn})^{-\frac{\theta}{1-\rho}}\right)^{-\rho} A_\ell(\eta_{i\ell}^{\frac{1}{1-\sigma}}\xi_{i\ell n})^{-\frac{\theta}{1-\rho}}(c_n^*)^\theta \\
&= T_i\Psi_{in}^{\frac{-\rho}{1-\rho}}(\psi_{i\ell n}\Psi_{in}^{\frac{1}{1-\rho}})(c_n^*)^\theta \\
&= T_i\Psi_{in}\psi_{i\ell n}(c_n^*)^\theta
\end{aligned} \tag{A.3}$$

While the probability that firms from i will serve market n is:

$$\Pr\left(\min_k c_{ikn}(\omega) \le c_n^*\right) = \sum_k T_i\psi_{ikn}\Psi_{in}\left(c_n^*\right)^\theta = T_i\Psi_{in}\left(c_n^*\right)^\theta \tag{A.4}$$

Hence, by conditional probability equation we can get:

$$\Pr\left(\arg\min_k c_{ikn}(\omega) = \ell \mid \min_k c_{ikn}(\omega) \le c_n^*\right) = \psi_{iln} \tag{A.5}$$

2. Derivation of equation (8)

(A.3) represents the probability that firms from country i serving country n will choose ℓ as the place of production. By the law of large numbers, this probability can be multiplied by the total number of firms M_i in i to obtain the number of firms exporting to n through ℓ production sites:

$$M_{i\ell n} = M_i T_i \Psi_{in}\psi_{i\ell n}\left(\frac{\sigma w_n F_n}{X_n}\right)^{\frac{\theta}{1-\sigma}}\frac{P_n^\theta}{\tilde{\sigma}^\theta} \tag{A.6}$$

Recall CES demand function $q_n(\omega) = \left(\frac{p_n(\omega)}{P_n}\right)^{-\sigma}\frac{X_n}{P_n}$, then a firm with cost c has sales of $\tilde{\sigma}^{1-\sigma}X_n P_n^{\sigma-1}c^{1-\sigma}$ in n . Using (A2), the sales of all firms in country i (whose costs must be less than the cutoff c_n^*) producing in ℓ for export to country n are

$$\begin{aligned}
X_{i\ell n} &= M_i T_i \Psi_{in}\psi_{i\ell n}\int_0^{c_n^*}\theta c^{\theta-1}\tilde{\sigma}^{1-\sigma}X_n P_n^{\sigma-1}c^{1-\sigma}dc \\
&= M_i T_i \Psi_{in}\psi_{i\ell n}\tilde{\sigma}X_n P_n^{\sigma-1}\int_0^{c_n^*}\theta c^{\theta-\sigma}dc
\end{aligned} \tag{A.7}$$

After integrating:

$$X_{i\ell n} = \frac{\tilde{\sigma}^{-\theta}\theta}{\theta-\sigma+1}M_i T_i \psi_{i\ell n}\Psi_{in}\left(\sigma w_n F_n\right)^{\frac{\theta-\sigma+1}{1-\sigma}} X_n^{\frac{\theta}{\sigma-1}}P_n^\theta \tag{A.8}$$

Thus we can get trilateral trade flows:

$$\pi_{i\ell n} = \frac{X_{i\ell n}}{X_n} = \psi_{i\ell n} \frac{M_i T_i \Psi_{in}}{\sum_k M_k T_k \Psi_{kn}} = \psi_{i\ell n} \lambda_{in}$$

3. Derivation of some important equations determining equilibrium

The equilibrium is composed of the vector (w_i, M_i). The reason is that the fixed marketing costs (marketing wage), net profits of a multinational from country i that invest and produce in country ℓ to serve country n are a fixed proportion of sales.

(1) The marketing wage is a fixed proportion of sales $\{X_{i\ell n}\}$ with the proportion $s = \frac{\theta-\sigma+1}{\sigma\theta}$.

First, we need to derive the relationship between multinationals numbers and $\{X_{i\ell n}\}$. Combine (A.6) and (A.8) and we can get:

$$M_{i\ell n} = \frac{\theta - \sigma + 1}{\sigma\theta} \frac{X_{i\ell n}}{w_n F_n}$$

Then it indicates that:

$$M_{i\ell n} w_n F_n = \frac{\theta - \sigma + 1}{\sigma\theta} X_{i\ell n} = s X_{i\ell n} \tag{A.9}$$

(2) The net profit is a fixed proportion of sales $\{X_{i\ell n}\}$ with the proportion $\tilde{s} = \frac{1}{\sigma} - s = \frac{\sigma-1}{\theta\sigma}$:

$$\Pi_{i\ell n} = \frac{X_{i\ell n}}{\sigma} - M_{i\ell n} w_n F_n = \left(\frac{1}{\sigma} - \frac{\theta - \sigma + 1}{\sigma\theta}\right) X_{i\ell n} = \tilde{s} X_{i\ell n} \tag{A.10}$$

and this equation also implies that total profits made in country ℓ are a fixed proportion of the production value in country ℓ: $\sum_{i,n} \Pi_{i\ell n} = \tilde{s} Y_\ell$.

The equlibrium wage is determined by the labor market clearing condition which requires:

$$\underbrace{w_\ell L_\ell}_{\text{Laobr income}} = \underbrace{\left(\frac{1}{\tilde{\sigma}}\right) \sum_{i,n} X_{i\ell n}}_{\text{Production Wage}} + \underbrace{s \sum_{i,k} X_{ik\ell}}_{\text{Marketing wage}} + \underbrace{\tilde{s} \sum_{k,n} X_{\ell kn}}_{\text{Profit}} + \Delta_\ell$$

where Δ_ℓ is exogenous current account imbalances:

$$
\begin{aligned}
\Delta_\ell &= X_\ell - \frac{1}{\tilde{\sigma}} \sum_{i,n} X_{i\ell n} - s \sum_{i,k} X_{ik\ell} - \tilde{s} \sum_{k,n} X_{\ell kn} \\
&= X_\ell - \frac{1}{\tilde{\sigma}} \sum_{i,n} X_{i\ell n} - s \sum_{i,k} X_{ik\ell} - \sum_{k,n} \Pi_{\ell kn} \\
&= X_\ell - \frac{1}{\tilde{\sigma}} \sum_{i,n} X_{i\ell n} + s(\sum_{i,n} X_{i\ell n} - \sum_{i,k} X_{ik\ell}) - \sum_{k,n} \Pi_{\ell kn} - s \sum_{i,n} X_{i\ell n} \\
&= X_\ell - \frac{1}{\tilde{\sigma}} \sum_{i,n} X_{i\ell n} + s(\sum_{i,n} X_{i\ell n} - \sum_{i,k} X_{ik\ell}) + s\tilde{s} \sum_{i,n} \Pi_{i\ell n} - \sum_{k,n} \Pi_{\ell kn} \\
&= \underbrace{X_\ell - Y_\ell}_{\text{trade deficit}} + \underbrace{s(Y_\ell - X_\ell)}_{\text{marketing deficit}} + \underbrace{\sum_{i,n} \Pi_{i\ell n} - \sum_{k,n} \Pi_{\ell kn}}_{\text{net income from FDI}}
\end{aligned}
\tag{A.11}
$$

4. Derivation of gains from openness

Recall trilateral share $\pi_{i\ell n} = \frac{X_{i\ell n}}{X_n} = \psi_{i\ell n} \frac{M_i T_i \Psi_{in}}{\sum_k M_k T_k \Psi_{kn}} = \psi_{i\ell n} \lambda_{in}$. Denote by $\lambda_{\ell n}^T = \sum_i \frac{X_{i\ell n}}{X_n}$ the trade share between country ℓ and n , thus the internal trade share is expressed by:

$$
\lambda_{nn}^T = \sum_i \frac{X_{inn}}{X_n} = \sum_i \frac{A_n (\eta_{i\ell}^{\frac{1}{1-\sigma}} \gamma_{in} w_n)^{-\frac{\theta}{1-\rho}}}{\Psi_{in}} \lambda_{in} \tag{A.12}
$$

Hence, we can get w_n:

$$
w_n = \left(\sum_i \frac{A_n (\eta_{i\ell}^{\frac{1}{1-\sigma}} \gamma_{in})^{-\frac{\theta}{1-\rho}}}{\Psi_{in}} \lambda_{in} \right)^{\frac{1-\rho}{\theta}} (\lambda_{nn}^T)^{-\frac{1-\rho}{\theta}} \tag{A.13}
$$

Recall the expression of price index:

$$
\begin{aligned}
P_n^{-\theta} &= \zeta^\theta \left(\frac{w_n F_n}{X_n} \right)^{-\frac{\theta-(\sigma-1)}{\sigma-1}} \left[\sum_k M_k T_k \Psi_{kn} \right] \\
&= \zeta^\theta \left(\frac{w_n F_n}{X_n} \right)^{-\frac{\theta-(\sigma-1)}{\sigma-1}} M_n T_n \Psi_{nn} \lambda_{nn}^{-1}
\end{aligned}
\tag{A.14}
$$

Use these two equations above, noting that $\Psi_{nn} = \left(\frac{A_n w_n^{-\frac{\theta}{1-\rho}}}{\psi_{nnn}} \right)^{1-\rho}$,

$$
\begin{aligned}
W_n = \frac{w_n}{P_n} &= \frac{\left(\sum_i \frac{A_n (\eta_{i\ell}^{\frac{1}{1-\sigma}} \gamma_{in})^{-\frac{\theta}{1-\rho}}}{\Psi_{in}} \lambda_{in} \right)^{\frac{1-\rho}{\theta}} (\lambda_{nn}^T)^{-\frac{1-\rho}{\theta}} (M_n T_n \Psi_{nn})^{\frac{1}{\theta}} \lambda_{nn}^{-\frac{1}{\theta}}}{\zeta^{-1} \left(\frac{w_n F_n}{X_n} \right)^{\frac{\theta-(\sigma-1)}{(\sigma-1)\theta}}} \\
&= \frac{\left(\sum_i \frac{A_n (\eta_{i\ell}^{\frac{1}{1-\sigma}} \gamma_{in})^{-\frac{\theta}{1-\rho}}}{\Psi_{in}} \lambda_{in} \frac{A_n w_n^{-\frac{\theta}{1-\rho}}}{\psi_{nnn}} \right)^{\frac{1-\rho}{\theta}} (\lambda_{nn}^T)^{-\frac{1-\rho}{\theta}} (M_n T_n)^{\frac{1}{\theta}} \lambda_{nn}^{-\frac{1}{\theta}}}{\zeta^{-1} \left(\frac{w_n F_n}{X_n} \right)^{\frac{\theta-(\sigma-1)}{(\sigma-1)\theta}}} \\
&= \frac{\left(A_n \lambda_{nn}^T \frac{1}{\psi_{nnn}} \right)^{\frac{1-\rho}{\theta}} (\lambda_{nn}^T)^{-\frac{1-\rho}{\theta}} (M_n T_n)^{\frac{1}{\theta}} \lambda_{nn}^{-\frac{1}{\theta}}}{\zeta^{-1} \left(\frac{w_n F_n}{X_n} \right)^{\frac{\theta-(\sigma-1)}{(\sigma-1)\theta}}} \\
&= \frac{A_n^{\frac{1-\rho}{\theta}} \psi_{nnn}^{-\frac{1-\rho}{\theta}} (M_n T_n)^{\frac{1}{\theta}} \lambda_{nn}^{-\frac{1}{\theta}}}{\zeta^{-1} \left(\frac{w_n F_n}{X_n} \right)^{\frac{\theta-(\sigma-1)}{(\sigma-1)\theta}}} \\
&= \frac{A_n^{\frac{1-\rho}{\theta}} \psi_{nnn}^{-\frac{1-\rho}{\theta}} T_n^{\frac{1}{\theta}} \lambda_{nn}^{-\frac{1}{\theta}} (\tilde{s} Y_n^f)^{\frac{1}{\theta}} (f^e)^{-\frac{1}{\theta}} w_n^{-\frac{1}{\theta}}}{\zeta^{-1} \left(\frac{w_n F_n}{X_n} \right)^{\frac{\theta-(\sigma-1)}{(\sigma-1)\theta}}} \\
&= \frac{A_n^{\frac{1-\rho}{\theta}} \psi_{nnn}^{-\frac{1-\rho}{\theta}} T_n^{\frac{1}{\theta}} \lambda_{nn}^{-\frac{1}{\theta}} \tilde{s}^{\frac{1}{\theta}} (f^e)^{-\frac{1}{\theta}} (\frac{X_n}{w_n})^{\frac{1}{\sigma-1}} (\frac{Y_n^f}{X_n})^{\frac{1}{\theta}}}{\zeta^{-1} (F_n)^{\frac{\theta-(\sigma-1)}{(\sigma-1)\theta}}}
\end{aligned}
\tag{A.15}
$$

Thus, the gains from openness is :

$$
\begin{aligned}
W_n &= \left(\frac{\sum_\ell X_{n\ell n}}{\sum_{i,\ell} X_{i\ell n}} \right)^{-\frac{1}{\theta}} \left(\frac{X_{nnn}}{\sum_\ell X_{n\ell n}} \right)^{-\frac{1-\rho}{\theta}} \left(\frac{\sum_{i,\ell} X_{ni\ell}}{\sum_{i,\ell} X_{i\ell n}} \right)^{\frac{1}{\theta}} \\
&= \underbrace{\lambda_{nn}^{-\frac{1}{\theta}}}_{\text{Foreign technology effects}} \quad \underbrace{\psi_{nnn}^{-\frac{1-\rho}{\theta}}}_{\text{Offshoring effects}} \quad \underbrace{\left(\frac{Y_n^f}{X_n} \right)^{\frac{1}{\theta}}}_{\text{Innovation effects}}
\end{aligned}
\tag{A.16}
$$

A.2 Solution Procedure

B Data Appendix

This appendix section documents the source of the data and definitions of the variables used in the analysis. The summary statistics are provided in Table B.1. Traditional trade cost proxies can also determine FDI. Thus, we augment an empirical database constructed by Chang, Fujii and Jin (2022) which includes bilateral trade cost proxies, with additional cost proxies for bilateral foreign direct investment. To be specific, we add bilateral exchange rates, corporate tax rates differences, industrial similarity index, bilateral investment treaty as further cost proxies.

B.1 Traditional Trade Cost Proxies

The majority of the proxy variables for bilateral trade costs are gathered from the CEPII website.[20] The time-invariant variables include: population-weighted bilateral distance ($Dist_{i\ell}$) between partners i and ℓ; common language indicator ($ComLang_{i\ell}$), which equals one if a language is spoken by at least 9% of the population in both countries; common legal origin indicator ($ComLeg_{i\ell}$), which equals one if two countries share a common legal origin; indicator for whether exporter i has ever been a colonizer of importer ℓ ($Exheg_{i\ell}$); indicator for whether importer ℓ has ever been a colonizer of exporter i ($Imheg_{i\ell}$); common colonizer indicator ($ComCol_{i\ell}$), which equals one if two countries have had a common colonizer after 1945; and common border indicator ($Contig_{i\ell}$), which equals one if two countries share a common border. Other time-invariant variables come from different sources. The data on weighted F_{ST} genetic distance ($GenDist_{i\ell}$) comes from the dataset constructed by Spolaore and Wacziarg (2016), which can take values between 0 (no genetic distance) and 1 (maximum genetic distance). The common region indicator ($ComRegion_{i\ell}$) comes from World Bank, which equals one if two countries are located in the same region.[21] The data on the development stage of a country come from the Appendix Table 2 of Subramanian and Wei (2003). The indicator ($ComDev_{i\ell}$) equals one if two countries are both industrial countries or are both non-industrial countries. The indicator ($MID_{i\ell}$) is a weighted sum of Militarized Interstate Disputes (MIDs) directed from exporter i to importer j between 1816 and 1945. The Correlates of War (COW) project provides historical information on military disputes between countries.[22]

For time-variant variables, regional preferential trade agreements ($RTA_{i\ell,t}$) data are ob-

[20] http://www.cepii.fr.

[21] Countries fall into one of seven regions: East Asia and Pacific, Europe and Central Asia, Latin America and the Caribbean, Middle East and North Africa, North America, South Asia, and Sub-Saharan Africa.

[22] http://www.correlatesofwar.org.

tained from Mario Larch's Regional Trade Agreements Database[23]. The alliance indicator ($Alliance_{i\ell,t}$) equals one if partners are in a military alliance in year t (defense pact, neutrality or non-aggression treaty, or entente agreement). COW Formal Interstate Alliance Dataset is the source where 2012 is the final year of this dataset. We expanded the dataset to 2014 based on the assumption that the alliance pattern in 2013-2014 is identical to that in 2012-2013. Common political system indicator ($ComPol_{i\ell,t}$) comes from the website "Regime Types and Regime Change: A New Dataset", which equals one if two countries are both democracies or are both non-democracies.[24] Besides, we obtain polity scores from the Polity5 project and calculate absolute value of "polity2" between two countries as ($Poldist_{i\ell,t}$) to measure potential political risks in bilateral FDI process. The data on common currency indicator ($ComCur_{i\ell,t}$), which equals one if two countries use a common currency, come from the International Economics Data and Programs website (de Sousa, J, 2012).[25] We supplement the data with information from CEPII's Gravity dataset if missing in the former database.

B.2 Tariff and Non-Tariff Measures

The data on tariffand non-tariff measures (NTMs) are obtained from Chang, Fujii and Jin (2022).

B.3 Bilateral Exchange Rates

It is commonly claimed that exchange rate stability increases FDI by eliminating uncertainty and lowering transaction costs. The empirical data regarding the relationship between exchange rate and FDI is, however, relatively equivocal Harms and Knaze (2021). We follow existing literature to include bialteral exchange rates as a cost proxy or a determinant for FDI Blonigen et al. (2007); Baltagi, Egger and Pfaffermayr (2007). The IMF's International Financial Statistics provides historical IMF exchange rates to the U.S. Dollar for 168 currencies.[26] The exchange rate of each EU country after joining the EU is replaced by the EU's own exchange rate. We calculate annual (average) bilateral exchange rates based on origin currency per destination currency ($BiExrate_{i\ell,t}$).

[23]https://www.ewf.uni-bayreuth.de/en/research/RTA-data/index.html

[24]http://www.christianbjoernskov.com/bjoernskovrodedata/.

[25]http://jdesousa.univ.free.fr/data.htm

[26]https://data.imf.org/?sk=4C514D48-B6BA-49ED-8AB9-52B0C1A0179B

B.4 Corporate Tax Rates Differences

As the corporate tax burden would affect profitability in the host nation, it should be a factor in multinational corporations' investment location decisions. Barrios et al. (2012) find that both the host and source country tax systems are determinants affecting the location choice of MNCs. Thus, we obtain country-specific general corporate tax rates from Tax Foundation to calculate absolute value of general corporate tax rates differnce ($DiffTax_{i\ell,t}$).[27]. It is important to note that the dataset does not account for unique tax regimes, such as patent boxes, offshore regimes, or special rates for specialized businesses. There may be a separate tax rate for nonresident corporations in some countries. Due to a lack of specific data, this dataset does not account for nonresident tax rates that differ from the standard corporate rate.

B.5 Industrial Similarity Index

The similarity of bilateral industrial structures has a significant impact on FDI. Two countries with comparable industrial structures are more likely to collaborate in FDI because the host country would have precise access to technologicy capital and the parent country would have less uncertainty about earnings by investing in familiar industries. We control for similarity between the two countries' industrial structures using the indicator of industrial similarity index ($ISI_{i\ell,t}$) as inImbs (2004):

$$ISI_{i\ell,t} = -\sum_{h=1}^{n} \left| S_t^{i,h} - S_t^{\ell,h} \right|$$

where $S_t^{i,h}$ $\left(S_t^{\ell,h}\right)$ is the share of industry h in the total outputs of country i (country ℓ) in year t, and the multiplication by (-1) turns out that the higher the value, the higher the similarity. The industry-level outputs data comes from world IO table led by Eora26.[28] Our calculation is based on a simplified verison IO table with 26-sector harmonized classification for 190 countries.

B.6 Bilateral Investment Treaties

Similar to the development of bilateral or regional preferential trade agreements (RTAs) over the past 50 years, bilateral investment treaties (BITs) have expanded. In fact, the reason for such FDI agreements is quite similar to that of RTAs for trade. According to UNCTAD

[27] https://github.com/TaxFoundation/worldwide-corporate-tax-rates

[28] https://worldmrio.com/.

(2007)[29], several existing BITs guarantee foreign investors fair, nondiscriminatory, and "national" treatment. Salacuse and Sullivan (2005), Neumayer and Spess (2005), and Bergstrand and Egger (2013) find that BITs have statistically and economically significant effects on FDI flows. Data on BITs are obtained from Electronic Database of Investment Treaties (EDIT)[30] maintained by Alschner et al(2021). We selected all BITs including terminated BITs around the world and identified an undirectional country-pair time-variant indicatos ($BIT_{i\ell,t}$). The $BIT_{i\ell,t}$ equals one during the time interval when the BITs are in effect between two countries.

B.7 GDP, Value-added Share, Gross Output

We use the gross domestic product figures expressed in current US dollars from the World Development Indicators (WDI) and supplement missing figures with the GDP data from the CEPII website. The data on population come from the WDI, the IMF's International Financial Statistics (IFS) and the CEPII, in that order when the previous alternative is missing. We construct gross output Y_{it} data by taking the ratio of GDP and the value-added share it in gross output: $Y_{i,t} = GDP_{i,t}/\kappa_{it}$. The data on value-added share comes from Chang, Fujii and Jin (2022) which were compiled from several sources.

Table B.1: Summary statistics

Variable	Description	Count	Mean	Standard Deviation	Unit
$\tilde{X}^{trade}_{i\ell,t}$	bilateral country trade flows (million US$)	2486	20818	49537	i,ℓ,t
$\tilde{X}^{fdi}_{i\ell,t}$	bilateral country FDI stock (million US$)	2044	18623	56736	i,ℓ,t
$PS_{i\ell,t}$	country image (positive response ratio)	2486	0.400	0.199	i,ℓ,t
$LogBiExrate_{i\ell,t}$	log of bilateral country exchange rate (per destination currency)	2486	1.757	2.253	i,ℓ,t
$RTA_{i\ell,t}$	regional trade agreement indicator	2486	0.335	0.472	i,ℓ,t
$DiffTax_{i\ell,t}$	corporate tax rates differences	2410	0.068	0.047	i,ℓ,t
$ComPol_{i\ell,t}$	same political system indicator	2486	0.668	0.471	i,ℓ,t
$LogPoldist_{i\ell,t}$	log of bilateral country political distance	2486	1.266	0.942	i,ℓ,t
$BIT_{i\ell,t}$	bilateral country investment treaties	2486	0.332	0.471	i,ℓ,t
$ISI_{i\ell,t}$	industrial similarity index	2486	-0.554	0.184	i,ℓ,t
$NTM_{i\ell,t}$	intensity of non-tari measures	2486	0.037	0.162	i,ℓ,t
$LogTariff^{wa}_{i\ell,t}$	log of (1 + tariff rate): based on weighted average tariffrate	2309	0.047	0.054	i,ℓ,t

[29]https://unctad.org/webflyer/bilateral-investment-treaties-1995-2006-trends-investment-rulemaking
[30]https://edit.wti.org/document/investment-treaty/search

$LogTariff^{sa}_{i\ell,t}$	log of (1 + tariff rate): based on simple average tariffrate	2309	0.066	0.048	i, ℓ, t
$LogTariff^{la}_{i\ell,t}$	log of (1 + tariff rate): based on simple tariff line average tariffrate	2309	0.075	0.047	i, ℓ, t
$Alliance_{i\ell,t}$	alliance indicator	2486	0.209	0.407	i, ℓ, t
$ComCur_{i\ell,t}$	common currency indicator	2486	0.014	0.118	i, ℓ, t
$LogDist_{i\ell}$	log of population-weighted bilateral distance (km)	2486	8.837	0.674	i, ℓ
$GenDist_{i\ell}$	weighted F_{ST} genetic distance	2486	0.084	0.061	i, ℓ
$ComRegion_{i\ell}$	common region indicator	2486	0.138	0.345	i, ℓ
$ComCol_{i\ell}$	indicator for whether two countries have had a common colonizer after 1945	2486	0.039	0.194	i, ℓ
$ComLeg_{i\ell}$	common legal origin indicator	2486	0.277	0.448	i, ℓ
$ComLang_{i\ell}$	common language indicator	2486	0.251	0.434	i, ℓ
$Exheg_{i\ell}$	indicator for whether exporter i has ever been a colonizer of importer ℓ	2486	0.033	0.179	i, ℓ
$Imheg_{i\ell}$	indicator for whether importer ℓ has ever been a colonizer of exporter i	2486	0.040	0.197	i, ℓ
$ComDev_{i\ell}$	common development stage	2486	0.498	0.500	i, ℓ
$Contig_{i\ell}$	common border indicator	2486	0.054	0.227	i, ℓ
$MID_{i\ell}$	weighted sum of militarized interstate disputes during 1816-1945	2486	8.296	19.017	i, ℓ

Table B.2: Regression of correlations in $PS_{i\ell,t}$ and $\Delta PS_{i\ell,t}$ across country pairs

	Correlation of		Correlation of	
	$(PS_{i\ell,t}, PS_{i'\ell,t})$	$(PS_{i\ell,t}, PS_{i\ell',t})$	$(\Delta PS_{i\ell,t}, \Delta PS_{i'\ell,t})$	$(\Delta PS_{i\ell,t}, \Delta PS_{i\ell',t})$
$LogDist_{i\ell}$	0.0172	-0.0359	0.000832	-0.00925
	(0.0178)	(0.0221)	(0.0214)	(0.0247)
$GenDist_{i\ell}$	-0.711***	0.716***	-0.834***	0.597***
	(0.132)	(0.178)	(0.156)	(0.198)
$ComRegion_{i\ell}$	0.0406	0.0286	0.0201	0.0410
	(0.0297)	(0.0432)	(0.0355)	(0.0482)
$ComPol_{i\ell,t}$	0.0836***	0.0299	0.0719***	-0.00548
	(0.0232)	(0.0199)	(0.0271)	(0.0221)
$ComCol_{i\ell}$	-0.114***	0.0512	-0.231***	0.0918
	(0.0425)	(0.0560)	(0.0504)	(0.0623)
$ComLeg_{i\ell}$	0.0131	0.0232	-0.00701	0.0319
	(0.0206)	(0.0248)	(0.0249)	(0.0278)
$RTA_{i\ell,t}$	-0.0474**	0.0650***	-0.00185	0.0347
	(0.0184)	(0.0229)	(0.0217)	(0.0254)
$Alliance_{i\ell,t}$	0.0423*	0.0952***	-0.0477	0.0940***
	(0.0246)	(0.0266)	(0.0293)	(0.0296)
$ComCur_{i\ell,t}$	-0.0342	0.125	-0.0774	0.0448
	(0.0733)	(0.0980)	(0.0869)	(0.109)
$ComLang_{i\ell}$	0.0681***	-0.0310	0.105***	-0.0569**
	(0.0221)	(0.0246)	(0.0263)	(0.0276)
$ComDev_{i\ell}$	0.0448***	0.0205	0.0829***	0.0259
	(0.0167)	(0.0192)	(0.0199)	(0.0214)
$Contig_{i\ell}$	0.0172	-0.0781*	0.0917*	-0.0888*
	(0.0441)	(0.0449)	(0.0532)	(0.0503)
$MID_{i\ell}$	-0.000667**	0.000771***	-0.000382	0.000708**
	(0.000270)	(0.000255)	(0.000320)	(0.000283)
constant	-0.0984	0.554***	0.0437	0.354
	(0.164)	(0.194)	(0.198)	(0.217)
N	3443	2142	3378	2125
R^2	0.059	0.213	0.035	0.233

Note: This table documents regression of correlations in $PS_{i\ell,t}$ and $\Delta PS_{i\ell,t}$ across evaluating countries ii' and evaluated countries $\ell\ell'$. Since correlations are symmetric in (i, i') or in (ℓ, ℓ'), we use only the lower-triangle of the correlation matrix (excluding the diagonal of ones).

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