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Fiscal decentralization, endogenous policies, and foreign direct investment: Theory and evidence from China and India ☆

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ABSTRACT

A political-economy model is developed to explain why fiscal decentralization may have a non-monotonic effect on FDI inflows through endogenous policies. Too much fiscal decentralization hurts central government incentives, whereas too little fiscal decentralization renders the local governments vulnerable to capture by the protectionist special interest groups. Moreover, the local government's preference for FDI can be endogenously polarized; therefore, a small change in fiscal decentralization across certain threshold values may lead to a dramatic difference in equilibrium FDI inflows. Empirical investigations support the idea that the difference in fiscal decentralization is an important reason for the nine-fold difference in FDI per capita between China and India. Cross-country regression results also support the inverted-U relationship.

1. Introduction

Foreign direct investment (FDI) helps facilitate economic growth in developing countries because it not only brings more physical capital but also embodies better foreign technology.[1] However, in reality, government policies toward FDI vary tremendously across countries. For example, China's central government encourages FDI inflows by authorizing long tax holidays and tariff reductions on imported inputs to foreign-invested firms. Meanwhile, local governments in China compete aggressively for FDI by offering favorable policies, including simplifying license application, charging low fees for land use, building facilitating infrastructure, etc. In contrast, we did not see such enthusiasm for FDI at the central or the local level of the Indian government until very recently. For instance, the corporate income tax rate on foreign-invested firms was 41% in India but well below 33% in China in 2004.[2] The de facto institutional barriers to FDI are also much higher in India. It takes almost 50% longer to obtain a license and it is five times more costly (relative to its own per capita income) to start a business in India than China, according to the World Bank (2005). India's infrastructure is also significantly inferior to China's (Bosworth and Collins, 2007; Singh, 2005).

In 2005, China's aggregate FDI inflow was more than US$ 72 billion, approximately twelve times that of India, and China's per capita FDI was nine times greater according to UNCTAD (2008). Bosworth and Collins (2007) find that such a significant difference in FDI is surprising because it cannot be explained by the countries' differences in economic fundamentals. Srinivasan (2006) notes, "Although India has attracted far less FDI [than China], it is not because of the lack of potential opportunities in India, but largely because of policy hurdles and other constraints

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[1] Javorcik (2004), McGrattan and Prescott (2009), and Rodriguez-Clare (1996)all provide supporting evidence for this positive effect, the magnitude of which is often conditional on characteristics such as human capital and financial development of the host country (Alfaro et al., 2010; Borensztein et al., 1998; Doucouliagos et al., 2010).

[2] Based on PricewaterhouseCoopers (2006). The de facto difference is much larger when the entire tax package is taken into consideration. The special economic zones and the open cities in China enjoy a much lower corporate income tax rate (15% to 20%) (see Cheng and Kwan (2000) and Prasad and Wei (2005) for more discussion).

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on investment." Panagariya (2006) emphasizes that India's underperformance, FDI included, is the result of "stupid domestic policies" such as not improving the national infrastructure. Rodrik and Subramanian (2005) also argue that India's policy toward FDI largely reflects the reluctant "attitude" of the government.

The China–India example suggests that it is important to understand why government attitudes and policies toward FDI can be so different, which in turn may lead to striking differences in FDI inflows. Therefore, the first goal of this paper is to shed light on this question theoretically.[3] The second goal is to explain why the effect of fiscal decentralization on FDI can be non-monotonic. Fiscal decentralization is a leading explanation in the literature for why local governments have been competing ferociously for FDI in China, the largest FDI recipient among all the developing countries (Cheng and Kwan, 2000; Qian and Roland, 1998; Xu, forthcoming). The main argument is the "Tiebout effect," namely, more decentralization fosters more intensive regional competition for mobile factors. However, this conventional wisdom does not seem to square well with the fact that the governmental "attitude" toward FDI and the related policies are much less friendly in India than in China, although India is more fiscally decentralized than China.[4] In fact, there exists no clear cross-country empirical evidence supporting a positive relationship between fiscal decentralization and FDI inflows (Bardhan and Mookherjee, 2006; Jensen, 2005, 2006). Instead, we find that there exists a robust inverted-U relationship between fiscal decentralization and FDI in the cross-country regression analysis.[5] What is the underlying mechanism for this non-monotonicity?

This paper attempts to simultaneously achieve these two goals by constructing a formal political-economy model of FDI and fiscal decentralization. We show that the degree of fiscal decentralization asymmetrically affects the incentives of different government levels, which in turn determines the policy choices at different government levels, resulting in a non-monotonic effect of fiscal decentralization on FDI. More specifically, too much fiscal decentralization hurts the incentive of the central government to attract FDI; hence, the central government would choose a tariff rate and profit tax rate profile to induce local governments to block FDI. In contrast, too little fiscal decentralization would render the local government captured by protectionist special interest groups. Therefore, the policies toward FDI are sufficiently favorable only when fiscal decentralization is in some endogenous medium range. Moreover, the equilibrium amount of FDI might polarize and, in some cases, it depends sensitively on fiscal decentralization. That is, a small change in fiscal decentralization might *sometimes* lead to policy changes that trigger a switch from the no-FDI equilibrium to the high-FDI equilibrium or vice versa. The amplification is the result of the fact that the preference for FDI can be endogenously polarized at the local government level, indicating that fiscal decentralization moving across certain endogenous cutoff values, albeit a small change, would lead to a diametrical attitude shift and policy change at the local government level. However, such a swing in equilibrium does not occur if fiscal decentralization changes within the "inaction region." The logic of the model is general and applicable to economies beyond China and India.

In the model, the FDI-relevant policies are endogenously determined through the political game between the central and local governments, which are sequentially lobbied by a special interest group, and standard economic activities are coordinated by the market-clearing prices. The interaction between the political and market sectors determines the political equilibrium, which is characterized by backward induction. First, we show how the decreasing negative pecuniary externality of FDI can lead to the attitudinal polarization of a local government toward FDI, which translates into sharply different policies and an equilibrium FDI outcome: either zero or full FDI (i.e., all investors choose FDI). Two competing forces determine the local government's "attitude" toward FDI. One is the tax-base expansion effect, i.e., more FDI implies more foreign firms from which to collect taxes. The other is the profit-reduction effect; i.e., more FDI implies more intensive competition and hence lower average profit tax revenue from each firm. In turn, which effect dominates is determined by the profit tax rate and the tariff rate, both chosen by the central government. These policy variables also affect the standard proximity-concentration trade-off for potential foreign investors' decisions regarding FDI versus export. Therefore, both demand and supply for FDI change when fiscal decentralization varies. In particular, a small deviation in fiscal decentralization can sometimes be amplified into a stark difference in equilibrium FDI inflow. Second, we show how the central government, which is also lobbied by the special interest group and foresees the bimodal outcome of FDI attributable to local government behavior, implements its favorable equilibrium by selecting an incentive-compatible policy profile to induce the local government(s) to either compete for or block FDI. The full-FDI equilibrium is implemented only when the degree of fiscal decentralization provides sufficient incentives at both levels of government and overcomes lobbying by the special interest group. The balance of interests for these different political players generates the non-monotonicity result. We also show that the two main results (i.e., the non-monotonic effect of fiscal decentralization on FDI and the endogenous polarization of local government FDI policy) remain valid regardless of the number of horizontal subnational localities.

The contribution of this paper is primarily theoretical, but some simple quantitative investigations are conducted to substantiate the theoretical findings. First, we follow the standard macroeconomic methodology to calibrate the model using real data on China and India. The simulation results turn out to closely match China's and India's macro and policy data, such as GDP, FDI, labor allocation across different sectors, profits in each sector and the tariff rates and profit tax rates. Counterfactual experiments suggest that these countries' difference in fiscal decentralization can help explain their differences in several key policy variables and why China's FDI per capita is nine times larger than that of India. We show that China's fiscal decentralization falls onto the endogenous "medium range" for China, whereas its Indian counterpart is too fiscally decentralized when controlling for the other relevant factors. In addition, regression analyses are undertaken with a larger cross-country sample. Again, we find that the inverted-U-shaped relationship between fiscal decentralization and FDI is significantly and robustly supported by the data with or without controlling for various factors such as the economic and institutional variables.

The paper is organized as follows. The next section highlights the relation and contribution of this paper to the pertinent literature. Section 3 presents the theoretical model. The quantitative exploration is provided in Section 4. The last section concludes with discussions about possible avenues for future research.

2. Relation to the literature

This paper is most closely related to the endogenous tariff determination models of trade and FDI in Grossman and Helpman (1994, 1996). Our model extends their framework in several important ways. First, we extend their single-layer government setting into one with a hierarchical government structure, which enables us to explore both the vertical interaction between the two layers of government and the horizontal interaction between different local governments. These interactions, especially the vertical interaction, are crucial for understanding FDI polarization, the non-monotonic effect

[3] At a deeper level, differences in economic fundamentals may also be the result, at least partly, of the policy or institutional differences.

[4] In 2004, the Chinese central government received 60% of total tax revenue whereas its Indian counterpart received 38%.

[5] A more detailed discussion on this empirical finding is deferred until Subsection 4.2. The hump-shaped relationship is also found in Kessing et al. (2007).

of fiscal decentralization, and regional allocations of FDI. None of these can be addressed in the original setting of Grossman and Helpman (1994, 1996). Second, our model explores the sequential lobbying in a hierarchic government, which is different from the standard menu auction with a single common agency in the literature on special interest groups (Becker, 1983; Grossman and Helpman, 2001). Third, we propose a mechanism of FDI polarization when FDI exhibits strategic substitutability, whereas FDI exhibits strategic complementarity in their model. Branstetter and Feenstra (2002) estimate the structural parameters in a modified Grossman–Helpman FDI model by using China's province-level data; however, the provincial government is not a decision-maker, nor is fiscal decentralization discussed. The FDI polarization in our model primarily comes from the endogenous institutional entry cost, which is exogenous in the previous papers.

Our paper also contributes to the literature on fiscal federalism by providing a new mechanism to rationalize the non-monotonic effect of fiscal decentralization on economic efficiency. Bardhan and Mookherjee (2000) argue that some intermediate level of fiscal decentralization could be optimal because local governments have better information on how to allocate resources more efficiently, but they are also more likely to succumb to pressure from local vested interests. Instead of emphasizing the information advantage of local governments, our perfect-information model places more emphases on the incentive compatibility of different levels of government. The Tiebout effect may fail in our model because subnational governments may not have sufficient incentives to attract mobile production factors in the first place, whereas the Tiebout effect fails to work in Cai and Treisman (2005) because they introduce regional heterogeneity and argue that poorly-endowed regions lose hope after more fiscal decentralization. Based on our knowledge, our paper is also the first "Grossman–Helpman" style political-economy model on FDI in the literature on fiscal federalism.[6]

Because FDI is modeled as better foreign technology, this paper also contributes to the literature on growth and development by explicitly examining the importance of fiscal decentralization and the roles of different layers of a hierarchical government in the adoption of technology. Parente and Prescott (1999) imply that hostile FDI policies will be installed when monopoly rents of the incumbent (domestic) firms are harmed by the new technology, whereas we show that the FDI policies can still be friendly in this case as long as the degree of fiscal decentralization enables both government levels to overcome the lobbying of the protectionist special interest groups. A politically secure incumbent government unambiguously adopts friendly FDI policies in Acemoglu and Robinson (2000) because they argue that superior technology is blocked primarily because the incumbent fears that its political power will be jeopardized. In contrast, we show that the central government, although always politically secure in our model, may still choose to implement a no-FDI equilibrium because of conflict of interests between different government levels. In addition, the local government's attitude toward FDI is shown to be polarized for reasons independent of political security. Acemoglu et al. (2007) show that countries with exogenously weaker contracting institutions tend to adopt less-advanced technologies. Our paper may help us understand how the quality of contracting institutions, as partly reflected in institutional entry cost, is endogenously affected by the rational choices of governments. Distinct from this literature, the supply of better technology is nontrivially modeled as a rational choice between export and FDI.[7]

3. Formal model

The model extends Grossman and Helpman (1994, 1996) by introducing two layers of governments (central and local) and making the fixed entry cost for FDI endogenous. FDI originates from a developed country and the host economy is a developing country. There are a policy-determining political sector and a price-coordinating market sector. Essentially, the market sector replicates that of Grossman and Helpman (1996) whereas the political sector now has three players: a central government, a local government, and a special interest group.

3.1. Market sector

3.1.1. Environment

3.1.1.1. Preference. The host economy is populated by a unit-mass continuum of households with the identical quasi-linear utility function:

$$U = x_0 + \frac{\theta}{\theta-1}x^{\frac{\theta-1}{\theta}}, \theta > 1, \tag{1}$$

where x_0 is the consumption of the numeraire good and x is the Dixit–Stiglitz aggregate of the differentiated goods with price elasticity equal to θ. Define

$$x \equiv \left[\int_{j\in N_h\cup N_f} x(j)^{\frac{\varepsilon-1}{\varepsilon}}dj\right]^{\frac{\varepsilon}{\varepsilon-1}}, \quad \varepsilon > 1, \tag{2}$$

where $x(j)$ denotes the consumption of brand j, and N_h and N_f are the sets of the domestic and foreign brands with measures n_h and n_f, respectively. Let N_m, a subset of N_f with measure n_m, denote the set of foreign brands produced by the foreign-invested firms located in the host country. Following Grossman and Helpman (1994), FDI is modeled as the establishment of a plant by the headquarters of a multinational firm in the host economy, so n_m measures the magnitude of FDI. The set of imported foreign brands has a measure $n_f - n_m$. $\varepsilon > \theta$ is assumed to ensure a positive cross price elasticity of the demand. Define $N \equiv N_h \cup N_f$ for future reference.

3.1.1.2. Technology. Labor is the only production factor. All technologies are constant returns to scale. One unit of labor produces one unit of numeraire good; thus the wage is one. To produce one unit of each differentiated domestic good $j \in N_h$ requires c_h units of labor. Any imported good $j \in N_f/N_m$ is produced abroad and the unit cost is c_f in terms of foreign labor. Let w denote the foreign wage, which is no smaller than the domestic wage (set to unity). One unit of each multinational good $j \in N_m$ requires c_f units of domestic labor. That is, FDI fully transfers the foreign technology to the host country.[8] Assume $c_f < c_h$; thus inward FDI can also be interpreted as adopting better foreign technology in the sense that the set of goods produced in the host economy expands and the newly introduced foreign symmetric goods have lower labor cost.

3.1.1.3. Endowment. Each household is endowed with L units of labor, which are inelastically supplied. To exclude collusive pricing, owners of domestic firms are assumed to be of zero measure and scattered throughout the population. The after-tax net profit of the multinationals is repatriated to the source country. L is sufficiently large to enable the trade account to be balanced by exporting the numeraire goods to the international market at the competitive world price, which is set to one.

[6] Kessing et al. (2007) are among the few who examine the relationship between decentralization and FDI empirically with cross-country data. They find that vertical decentralization may hamper FDI inflows primarily because the cost of red tape increases with more layers of government.

[7] This FDI supply analysis is compatible with an important branch of the recent FDI-versus-trade literature that focuses on heterogeneous firms; see Helpman et al. (2004).

[8] Grossman and Helpman (1996) assume that the unit cost of the multinational good is c_h rather than c_f for each $j \in N_m$ and $w = 1$, which results in strategic complementarity among international investors. However, we have strategic substitutability, which makes our FDI amplification result less obvious.

3.1.1.4. Market structure. Labor is freely mobile across different sectors within a country but cannot move across different countries. The labor market is perfectly competitive. The numeraire good market is perfectly competitive both domestically and internationally. Each differentiated commodity $j \in N$ is produced only by a single firm, so all of these $(n_h + n_f)$ firms are engaged in monopolistic competition.

3.1.2. Market equilibrium

A tariff is imposed on each imported good $j \in N_f/N_m$. Let τ denote the gross ad valorem tariff rate, so the net tariff rate is $\tau - 1$. The quasi-linear utility function (1) implies the absence of an income effect on the demand for any good $j \in N$. The usual markup pricing rule gives the following equilibrium consumer prices:

$$p(j) = \begin{cases} ph \equiv \dfrac{\varepsilon}{\varepsilon - 1} c_h, & \text{if} \quad j \in N_h \\ pm \equiv \dfrac{\varepsilon}{\varepsilon - 1} c_f, & \text{if} \quad j \in N_m \\ pf \equiv \dfrac{\varepsilon}{\varepsilon - 1} c_f w\tau, & \text{if} \quad j \in N_f/N_m \end{cases}. \tag{3}$$

The household utility maximization problem gives the market demand for each differentiated good:

$$x(j) = \begin{cases} x_h \equiv p_h^{-\varepsilon} q^{\varepsilon-\theta}, & \text{if} \quad j \in N_h \\ x_m \equiv p_m^{-\varepsilon} q^{\varepsilon-\theta}, & \text{if} \quad j \in N_m \\ x_f \equiv p_f^{-\varepsilon} q^{\varepsilon-\theta}, & \text{if} \quad j \in N_f/N_m \end{cases}, \tag{4}$$

where q is the price index for the aggregate good x:

$$q(n_m) = \left[n_h {p_h}^{1-\varepsilon} + n_m {p_m}^{1-\varepsilon} + \left(n_f - n_m \right) {p_f}^{1-\varepsilon} \right]^{\frac{1}{1-\varepsilon}}. \tag{5}$$

Each firm takes q as exogenous because there is a continuum of firms. The profit of firm j is given by

$$\pi(j) = \begin{cases} \pi_h(n_m, \tau) \equiv \dfrac{1}{\varepsilon} p_h^{1-\varepsilon} q(n_m)^{\varepsilon-\theta}, & \text{if} \quad j \in N_h \\ \pi_m(n_m, \tau) \equiv \dfrac{1}{\varepsilon} p_m^{1-\varepsilon} q(n_m)^{\varepsilon-\theta}, & \text{if} \quad j \in N_m \\ \pi_f(n_m, \tau) \equiv \dfrac{1}{\varepsilon\tau} p_f^{1-\varepsilon} q(n_m)^{\varepsilon-\theta}, & \text{if} \quad j \in N_f/N_m \end{cases}, \tag{6}$$

which immediately implies

$$\frac{\partial \pi_m(n_m, \tau)}{\partial n_m} < 0, \frac{\partial \pi_h(n_m, \tau)}{\partial n_m} < 0 \frac{\partial \pi_f(n_m, \tau)}{\partial n_m} < 0. \tag{7}$$

The negative pecuniary externality caused by multinational firms results from consumer love for variety and the increased intensity of cost competition among firms; because $p_m < p_f$ as foreign-invested firms use cheaper local labor and avoid the tariff burden. However, the negative marginal impact of FDI on profits is diminishing for any firm $j \in N_h \cup N_m$:

$$\frac{\partial^2 \pi_m(n_m, \tau)}{\partial n_m^2} > 0, \frac{\partial^2 \pi_m(n_m, \tau)}{\partial n_m^2} > 0. \tag{8}$$

Eq. (6) also implies

$$\frac{\partial \pi_f(n_m, \tau)}{\partial \tau} < 0, \frac{\partial \pi_m(n_m, \tau)}{\partial \tau} > 0, \frac{\partial \pi_h(n_m, \tau)}{\partial \tau} > 0 \text{ for any } n_m \in \left[0, n_f\right), \tag{9}$$

because as τ increases, imports become more expensive, indicating that profits of each foreign exporting firm decrease, but demand for both domestic and FDI goods increases from the substitution effect; hence, these firms have higher profits even though the marginal impact diminishes:

$$\frac{\partial^2 \pi_f(n_m, \tau)}{\partial \tau^2} > 0, \frac{\partial^2 \pi_m(n_m, \tau)}{\partial \tau^2} < 0 \frac{\partial^2 \pi_h(n_m, \tau)}{\partial \tau^2} < 0 \text{ for any } n_m \in \left[0, n_f\right). \tag{10}$$

To determine n_m in the equilibrium, we first look at the supply of FDI.

3.1.3. FDI versus exporting

Following Grossman and Helpman (1996), we assume that FDI is horizontal, greenfield, and fully foreign-owned.[9] All output of foreign-invested firms (interchangeably, multinational firms) serves only the market of the host economy.[10] The owners of the n_f foreign firms (called potential foreign investors) simultaneously and non-cooperatively decide whether to make FDI or to export to this developing country depending on which option is more profitable. In addition to the tariff rate τ, two other policy variables affect their entry decisions. One is the profit tax rate λ on foreign-invested firms. The second is the institutional entry cost ϕ for FDI, which captures barriers such as the cost to wait to obtain a license. Assume that $\phi \geq 0$. Given the policy variables $\{\phi, \lambda, \tau\}$, a firm $j \in N_f$ makes FDI (denoted as $FDI_j = 1$) rather than exports ($FDI_j = 0$) if and only if the after-tax profit of making FDI net of the fixed entry cost is larger than the profit of exporting:

$$(1-\lambda)\pi_m(n_m, \tau) - \phi \geq \pi_f(n_m, \tau). \tag{11}$$

Each investor takes n_m as unaffected by his own decision. The total FDI is $n_m = \int_{j \in N_f} FDI_j \, dj$. The remaining $n_f - n_m$ foreign firms choose to export. A potential investor feels indifferent between making FDI and exporting when Eq. (11) holds as an equality, from which we obtain n_m as a continuous function of the three policy variables, denoted by $n_m(\phi, \lambda, \tau)$. This FDI supply function is shown in Fig. 1.[11]

Therefore, equilibrium FDI $n_m(\phi, \lambda, \tau)$ equals n_f when ϕ and λ are both sufficiently small and it equals 0 when ϕ is sufficiently large.

To analyze the governmental preference (demand) for FDI and how the three policy variables $\{\phi, \lambda, \tau\}$ are endogenously determined, we need to specify the setting for the political sector.

3.2. Political sector

To focus on the vertical interaction between the central and local governments, we consider the simplest case of a hierarchic government with only one province. The main results are shown to remain robust for any arbitrary number of provinces because whether different provincial governments want to compete for FDI first depends on the policies chosen by the central government, which is the key point of this paper. The central and provincial governments both attempt to maximize a weighted sum of the fiscal revenues and social welfare in a similar fashion to Grossman and Helpman (1996). The third player

[9] Greenfield FDI is much more common in developing economies than in developed economies (see Prasad and Wei (2005) and Wei (2000)).

[10] FDI sometimes comes into developing economies to use these economies as a production base to serve the international market, which is also true for China. In Wang (2009), I also explicitly examine this export effect on FDI and show that it does not change the qualitative mechanisms in this paper. Quantitatively, this export effect can be partly captured by the substitution elasticity parameter ε in the calibration, as is explained later. In addition, an increasing fraction of the FDI inflow is targeted to China's domestic market as the country becomes richer, especially after 2000 (see Prasad and Wei, 2005).

[11] The values for $\underline{\phi}$ and $\overline{\phi}$ are determined by the model, as is shown later.

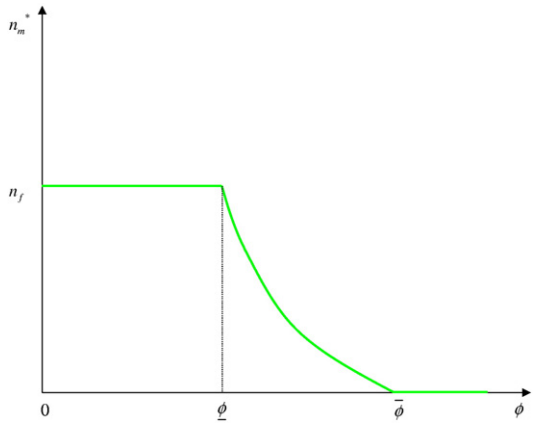

Fig. 1. Equilibrium FDI as a function of entry cost ϕ when λ is sufficiently small.

in the policy-making process is the special interest group (henceforth SIG) formed by the owners of all domestic firms. The SIG attempts to maximize its net gain by lobbying both the central and the provincial governments to block FDI (recall Eq. (7)).[12]

3.3. Timing and definition of equilibrium

In China and many other developing countries, the central government often plays a predominant role by either explicitly authorizing or implicitly permitting the local governments to take some actions, and then the local governments respond strategically and not always cooperatively. For example, India also shares the salient feature of central planning. In light of these institutional features, it is natural to assume that the national-level SIG would lobby sequentially, starting from the central government and then the local government. More specifically, the timing is as follows. The SIG first lobbies the central government by providing a non-negative contribution menu $C(\lambda, \tau)$, which is a committed money transfer to the central government conditional on the latter choosing the policy profile (λ, τ). Next, the central government chooses (λ, τ) and receives the money. After this first-stage lobby game, λ and τ are publicly known and the SIG lobbies the provincial government by providing a non-negative contribution menu $D(\phi; \lambda, \tau)$. Then, the provincial government chooses ϕ and is paid by the SIG. After this second-stage lobby game, all policy variables $\{\phi, \lambda, \tau\}$ are chosen and publicly observed.[13] Then, all foreign potential investors make binary decisions on FDI versus export simultaneously and non-cooperatively, followed by the standard market process (production, exchange, and consumption) and all markets clear. The standard market equilibrium gives us FDI n_m as well as the profit functions $\pi_f(n_m, \tau)$, $\pi_m(n_m, \tau)$ and $\pi_h(n_m, \tau)$. For simplicity, we assume perfect information in the two-stage political game.

Definition. A political equilibrium in a single-province economy is a collection of policy variables $\{\phi^*, \tau^*, \lambda^*\}$, commodity prices $p^*(j)$ and quantities $x^*(j)$, for $j \in N$, lobby schedule functions $C^*(\lambda, \tau)$ and $D^*(\phi; \lambda, \tau)$, and investment decisions $FDI_j^* \in \{0, 1\}$; for all $j \in N_f$, such that

1. The SIG maximizes its net gain by sequentially lobbying the central and the local governments with lobby functions $C^*(\lambda, \tau)$ and $D^*(\phi; \lambda, \tau)$;
2. The central government maximizes its goal function by choosing τ^* and λ^*;
3. Given τ^*, λ^* and $D^*(\phi; \lambda, \tau)$, the provincial government maximizes its goal function by choosing ϕ^*;
4. Given policy variables $\{\phi^*, \tau^*, \lambda^*\}$, each potential investor $j \in N_f$ makes the investment decision FDI_j^*, pricing decision $p^*(j)$ and output decision $x^*(j)$. FDI_j^* is the best response to all $FDI_{j'}^*, j' \in N_f, j' \neq j$;
5. Each domestic firm $j \in N_h$ maximizes profits by choosing $p^*(j)$ and $x^*(j)$;
6. Each household maximizes utility (1) by choosing the right consumption for numeraire goods and $x^*(j)$ for $j \in N$ subject to the corresponding budget constraint;
7. Markets clear for labor and each domestically produced and consumed commodity, and the international payment is balanced for the host economy.

Backward induction is used to characterize the political equilibrium. We first analyze the supply of FDI for given policies, and then we analyze the provincial government's preference (demand) for FDI during the second-stage lobby game in which we obtain the FDI polarization result. Next, we move up to the first-stage lobby game (at the central government level) and show how fiscal decentralization can have a non-monotonic effect on equilibrium policies and FDI.

The equilibrium of the market sector and the FDI supply decision for given policies have already been characterized in Subsection 3.1; therefore we are now ready to derive the polarization result during the second-stage lobby game. It is shown that FDI polarization primarily results from the endogenous polarization of the provincial government's preference for FDI.

3.4. FDI polarization

By this time, recall that the central government has already chosen λ and τ and has been paid $C(\lambda, \tau)$, all of which are determined in the first-stage lobby game. For now, we assume that the provincial government only cares about its revenue, which is the sum of the total profit tax revenue and the lobby contribution $D(\phi; \lambda, \tau)$.[14] The profit tax revenue has two parts. One part is from the foreign-invested firms and the other part is from the domestic firms, which pay the profit tax at the exogenous rate $\bar{\lambda}$.[15] Therefore, the goal function of the provincial government is

$$V_p(\phi; \lambda, \tau) \equiv (1-\gamma)\left[\lambda n_m \pi_m(n_m, \tau) + \bar{\lambda} n_h \pi_h(n_m, \tau)\right] + D(\phi; \lambda, \tau), \qquad (12)$$

where γ denotes the share of the total profit tax revenues accruing to the central government. Therefore, fiscal decentralization is measured by $1-\gamma$. We take $\gamma \in (0, 1)$ as exogenous.[16]

The SIG lobbies the provincial government to maximize its net return:

$$\max_{\hat{\phi} \geq 0, D(\phi; \lambda, \tau) \geq 0} (1-\bar{\lambda}) n_h \pi_h\left(n_m\left(\hat{\phi}, \lambda, \tau\right), \tau\right) - C(\lambda, \tau) - D\left(\hat{\phi}; \lambda, \tau\right) \qquad (13)$$

[12] Subsection 3.5 discusses what happens if foreign firms are also able to lobby.

[13] In reality, tariff rate τ is determined at the national government level in almost all the countries whereas the magnitude of the de facto institutional entry cost ϕ is largely at the discretion of local governments even if, in some cases, the rules are made by the central government. For example, in China, the FDI projects that exceed a certain threshold value must be approved by the central government, but the local government can still affect ϕ through the provision of public goods and services. λ represents the overall basket of tax instruments but is interpreted in the model as the non-distortive profit tax rate to simplify the analysis. Some taxes are levied exclusively by the local government or exclusively by the central government; however, others are co-charged by the two government levels including corporate and individual income taxes and value-added taxes. For simplicity, the policy instrument λ is assigned to the central government alone in this model, but profit tax revenues are shared according to the fiscal decentralization parameter γ to be introduced soon.

[14] See Wei (2000) for additional justifications. Later, Subsection 3.5 explicitly shows that the main results are quite robust for various changes in the model specifications, including the case in which the local government also cares about public welfare, employment, and GDP.

[15] It is innocuous to take $\bar{\lambda}$ as exogenous, because what really matters for the polarization result is the endogenous ratio $\frac{\lambda}{\bar{\lambda}}$ in the equilibrium rather than the absolute value of $\bar{\lambda}$, as will become clear after we derive the equilibrium value for λ (i.e., $\tilde{\lambda}$) obtained from Eq. (18) and Proposition 1.

[16] See discussions on how to endogenize γ in Subsection 3.7.

subject to the incentive compatibility constraint:

$$\hat{\phi} \in \arg\max_{\phi \geq 0} Vp(\phi; \lambda, \pi), \tag{14}$$

and the participation constraint:

$$V_p\left(\hat{\phi}; \lambda, \tau\right) \geq \max_{\phi \geq 0} \left[V_p(\phi; \lambda, \tau) - D(\phi; \lambda, \tau)\right], \tag{15}$$

where $Vp(\phi; \lambda, \tau) - D(\phi; \lambda, \tau)$ is the provincial government's return without being lobbied. As $D(\phi; \lambda, \tau) \geq 0$, Eq. (15) is guaranteed by Eq. (14).

We first examine the provincial government's preference (demand) for FDI and then derive the optimal $\hat{\phi}$ from function $n_m(\phi, \lambda, \tau)$ obtained from Eq. (11). Due to transferable utility, the SIG can extract all the surplus by making Eq. (15) exactly binding. Adding the two goal functions (12) and (13) together yields

$$\max_{n_m \in [0, n_f]} \lambda(1-\gamma) n_m \pi_m(n_m, \tau) + (1-\gamma\overline{\lambda}) n_h \pi_h(n_m, \tau), \tag{16}$$

which determines the provincial government's preference for FDI. The first term in Eq. (16) is the provincial government's profit tax revenue from the multinational firms. The second term is the total profit of domestic firms net of the tax payment to the central government. The (virtual) coalition of the SIG and the provincial government attempts to maximize the sum. The transferable utility ensures that the SIG and the government have the same ultimate demand for FDI as their coalition.

Using brute force, we show that, as n_m increases, the goal function in Eq. (16) first strictly decreases then strictly increases with n_m, thus FDI demand is a corner solution:

$$n_m^d = \begin{cases} 0, & \text{when} \quad \lambda < \tilde{\lambda}^s(\tau) \\ 0 \text{ or } n_f, & \text{when} \quad \lambda = \tilde{\lambda}^s(\tau) \\ n_f, & \text{when} \quad \lambda > \tilde{\lambda}^s(\tau), \end{cases}$$

where

$$\tilde{\lambda}^s(\tau) \equiv \frac{1-\gamma\overline{\lambda}}{1-\gamma} \left(\frac{n_h\left[\pi_h(0,\tau) - \pi_h\left(n_f, \tau\right)\right]}{n_f \pi_m\left(n_f, \tau\right)} \right), \tag{17}$$

the superscript s denotes the case with the lobby of the SIG and superscript d represents demand. That is, the provincial government's preference for FDI is polarized, hostile ($n_m^d = 0$), in which case the government imposes sufficiently high entry cost ϕ, or friendly ($n_m^d = n_f$), in which case it makes ϕ small enough to encourage full FDI.[17]

The intuition for this attitudinal polarization is straightforward. FDI has two competing effects from the government's point of view. On the one hand, more FDI implies more firms from which to collect taxes, which is the pro-FDI tax base expansion effect. On the other hand, more FDI means less profit revenue from each firm as competition increases, representing the anti-FDI revenue-reduction effect due to Eq. (7). The tax base expansion effect increases linearly with n_m but the revenue-reduction effect increases with n_m only at a diminishing speed (due to Eq. (10)); therefore, the revenue-reduction effect dominates the base-expansion effect when n_m is small, but the opposite is true when n_m becomes sufficiently large. Only when the profit tax rate on FDI, λ, is sufficiently large does the base-expansion effect dominate the profit-reduction effect.

The preference polarization also holds when no lobby is present because the two aforementioned competing forces remain true. To see this point, observe that the provincial government solves

$$\max_{n_m \in [0, n_f]} (1-\gamma)\left[\lambda n_m \pi_m(n_m, \tau) + \overline{\lambda} n_h \pi_h(n_m, \tau)\right], \tag{18}$$

yielding the following optimal demand for FDI (denoted by $\hat{n}_m^d$):

$$\hat{n}_m^d = \begin{cases} 0, & \text{when} \quad \lambda < \tilde{\lambda} \\ 0 \text{ or } n_f, & \text{when} \quad \lambda = \tilde{\lambda} \\ n_f, & \text{when} \quad \lambda > \tilde{\lambda}, \end{cases}$$

where $\tilde{\lambda} \equiv \left(\frac{n_h\left[\pi_h(0,\tau) - \pi_h\left(n_f, \tau\right)\right]}{n_f \pi_m\left(n_f, \tau\right)} \right) \overline{\lambda}$. Observe that $\tilde{\lambda}^s = \frac{1-\gamma\overline{\lambda}}{\overline{\lambda}(1-\gamma)} \tilde{\lambda} > \tilde{\lambda}$ because the provincial government must be compensated with a higher profit tax rate on FDI to offset the lobbying influence against FDI.[18]

When the provincial government wants FDI, it can set ϕ to zero, reducing Eq. (11) to $\lambda \leq 1 - \frac{\pi_f(n_m, \tau)}{\pi_m(n_m, \tau)} = 1 - w^{1-\varepsilon}\tau^{-\varepsilon}$ by using Eq. (6). Combining the supply and demand of FDI, we have the following "FDI polarization" result:

Proposition 1. FDI polarization

In the one-province economy, the equilibrium FDI is either none or full:

$$n_m^* = \begin{cases} n_f, \text{if} \quad \tilde{\lambda}^s(\tau) \leq \lambda \leq 1 - w^{1-\varepsilon\tau-\varepsilon} \\ 0, \qquad \text{otherwise}. \end{cases} \tag{19}$$

The proposition states that the equilibrium FDI is full ($n_m^* = n_f$) only when λ is both large enough to induce positive FDI demand from the provincial government and small enough to encourage positive FDI supply from foreign potential investors at any given τ. It is important to emphasize that the equilibrium switch only occurs when λ changes across one of the two threshold values, $\tilde{\lambda}^s(\tau)$ or $1 - w^{1-\varepsilon}\tau^{-\varepsilon}$.

For future reference, we derive the lobby function $D(\phi; \lambda, \tau)$. $D(\phi; \lambda, \tau) > 0$ if and only if the provincial government prefers the full-FDI equilibrium without being lobbied but the lobby changes its attitude. Therefore, $D(\phi; \lambda, \tau)$ can be derived from the binding participation constraint (15). For any other cases, $D(\phi; \lambda, \tau) = 0$ because it is unnecessary to lobby (when $\lambda > 1 - w^{1-\varepsilon}\tau^{-\varepsilon}$ or when $\lambda < \tilde{\lambda}$ or both) or because it is too costly to lobby (when $\tilde{\lambda}^s \leq \lambda \leq 1 - w^{1-\varepsilon}\tau^{-\varepsilon}$). Therefore, we can infer that $D(\phi; \lambda, \tau) = 0$

[17] More precisely, given τ and λ, the implied equilibrium entry cost ϕ is given by

$$\phi^* = \begin{cases} \text{any } \phi \leq \underline{\phi}, & \text{if} \quad \lambda \geq \tilde{\lambda}^s(\tau), \lambda < 1 - \tau^{-\varepsilon} w^{1-\varepsilon} \\ 0, & \text{if} \quad \lambda \geq \tilde{\lambda}^s(\tau), \lambda = 1 - \tau^{-\varepsilon} w^{1-\varepsilon} \\ \text{any } \phi \geq \overline{\phi}, & \text{if} \quad \lambda < \tilde{\lambda}^s(\tau), \lambda = 1 - \tau^{-\varepsilon} w^{1-\varepsilon} \\ \text{any } \phi \geq 0, & \text{if} \quad \lambda < \tilde{\lambda}^s(\tau), \lambda = 1 - \tau^{-\varepsilon} w^{1-\varepsilon} \\ \text{any } \phi \geq 0, & \text{if} \quad \lambda > 1 - \tau^{-\varepsilon} w^{1-\varepsilon}, \end{cases}$$

where

$$\underline{\phi} \equiv \frac{1}{\varepsilon}\left(n_h p_h^{1-\varepsilon} + n_f p_m^{1-\varepsilon}\right)^{\frac{\varepsilon-\theta}{1-\varepsilon}} \left(\frac{\varepsilon}{\varepsilon-1} c_f\right)^{1-\varepsilon} \left(1 - \lambda - \tau^{-\varepsilon} w^{1-\varepsilon}\right),$$

and

$$\overline{\phi} \equiv \frac{1}{\varepsilon}\left(n_h p_h^{1-\varepsilon} + n_f p_f^{1-\varepsilon}\right)^{\frac{\varepsilon-\theta}{1-\varepsilon}} \left(\frac{\varepsilon}{\varepsilon-1} c_f\right)^{1-\varepsilon} \left(1 - \lambda - \tau^{-\varepsilon} w^{1-\varepsilon}\right).$$

[18] Observe that $\frac{\partial \tilde{\lambda}^s}{\partial \lambda} < 0$ whereas $\frac{\partial \tilde{\lambda}}{\partial \lambda} > 0$. The reasons are as follows. With a lobby, the bargaining power of the SIG in the virtual coalition decreases with $\overline{\lambda}$; therefore, a welcoming attitude toward FDI requires a lower tax barrier $\tilde{\lambda}^s$. Without the lobby, to induce a friendly attitude of the provincial government toward FDI requires a higher profit tax rate on foreign-invested firms when the rival domestic firms pay a higher profit tax rate. Therefore, $\frac{\partial \tilde{\lambda}}{\partial \overline{\lambda}} > 0$. Also observe that $\frac{\partial \tilde{\lambda}^s}{\partial \lambda} > 0$ whereas $\frac{\partial \tilde{\lambda}}{\partial \lambda} > 0$. With a lobby, the bargaining power of the provincial government decreases with λ; therefore, the tax barrier to FDI is more determined by the SIG, hence $\frac{\partial \tilde{\lambda}^s}{\partial \lambda} > 0$. Without the lobby, γ is neutral for domestic firms and foreign-invested firms (see Eq. (18)). Therefore, we will lose the non-monotonicity result, one of the two key results in this paper, if the SIG is not present.

whenever $n_m^* > 0$, but $D(\phi; \lambda, \tau)$ could be positive if $n_m^* > 0$.[19] To summarize, we have

Lemma 1. *The optimal solution to the second-stage lobby game (Eq. (13)) is the following: $\hat{\phi}^*(\lambda, \tau)$ can be any value larger than $(1-\lambda)\pi_m(0, \tau) - \pi_f(0, \tau)$ when $\tilde{\lambda}(\tau) \le \lambda \le 1 - w^{1-\varepsilon}\tau^{-\varepsilon}$ and $\lambda < \tilde{\lambda}^s(\tau)$; $\hat{\phi}^*(\lambda, \tau) = 0$ when $\tilde{\lambda}^s(\tau) \le \lambda \le 1 - w^{1-\varepsilon}\tau^{-\varepsilon}$. $D^*(\phi; \lambda, \tau) = (1-\gamma)\left[\lambda n_f \pi_m(n_f, \tau) + \overline{\lambda} n_h \pi_h(n_f, \tau)\right]$ when $\tilde{\lambda}(\tau) \le \lambda \le 1 - w^{1-\varepsilon}\tau^{-\varepsilon}$, $\lambda < \tilde{\lambda}^s(\tau)$ and $\phi = \hat{\phi}^*$; $D^*(\phi; \lambda, \tau) = 0$ otherwise.*

Since FDI polarization is one of the two key theoretical results for this paper, it is helpful to discuss its robustness to alternative model specifications.

3.5. Robustness of FDI polarization

The key economic force behind FDI polarization is the endogenous polarization of the provincial government's preference for FDI. It is shown that this result of attitudinal polarization remains robust to several relevant changes to the model specifications.

First, what if foreign-invested firms also form a special interest group and lobby the provincial government?[20] In this case, the two SIGs are engaged in a menu auction. Given the quasi-linear preferences, the ultimate virtual goal function is again a linear sum of $n_m\pi_m(n_m, \tau)$ and $n_h\pi_h(n_m, \tau)$ with a higher weight on the former. Therefore, the polarization result still holds.[21] The main differences are that the threshold value for the profit tax rate is now different and that a larger proportion of surplus moves from the SIGs to the government.[22]

Second, what if a larger set of policy instruments (other than ϕ) for the provincial government is introduced explicitly into the model? More specifically, suppose the provincial government can also levy consumption tax at a gross ad valorem rate ς on all goods $j \in N$. Then, the new profit for each firm $j \in N_x$ becomes $\varsigma^{-\theta}\pi_x(n_m, \tau)$ for any $x \in \{f, m, h\}$. The total consumption tax revenue from domestic firms and foreign-invested firms turns out to be $(\varsigma-1)\varsigma^{-\theta}\varepsilon[n_h\pi_h(n_m, \tau) + n_m\pi_m(n_m, \tau)]$. The consumption tax revenue from all the imported goods is given by $(n_f - n_m)(\varsigma-1)\varsigma^{-\theta}\varepsilon w^{1-\varepsilon}\tau^{-\varepsilon}\pi_m(n_m, \tau)$. Therefore, the ultimate virtual goal function that determines the governmental preference for FDI is again a linear sum of $n_m\pi_m(n_m, \tau)$ and $n_h\pi_h(n_m, \tau)$; hence, the polarization result remains true.

Third, what if the provincial government not only cares about its tax revenue, but also cares about other things such as GDP, employment, welfare, etc.? To address this question, observe that the total labor employed by the domestic-brand firms is $n_h x_h c_h$. Total employment in the multinational sector is given by $n_m x_m c_f$. The rest of the labor force, $L - n_h x_h c - n_m x_m c_f$, is employed in the numeraire sector. GDP is the total output from all these three sectors:

$$\begin{aligned} \text{GDP} &= \left(L - n_h x_h c_h - n_m x_m c_f\right) + n_h p_h x_h - n_m p_m x_m \\ &= L + n_h \pi_h + n_m \pi_m. \end{aligned} \tag{20}$$

If domestic firms and foreign-invested firms are subject to a uniform profit tax rate ($\lambda = \overline{\lambda}$), then Eq. (18) is equivalent to GDP maximization and $\hat{n}_m^d = n_f$. Suppose the goal function (12) is modified as follows:

$$(1-\gamma)\left[\lambda n_m \pi_m(n_m, \tau) + \overline{\lambda} n_h \pi_h(n_m, \tau)\right] + D(\phi; \lambda, \tau) + \xi \cdot \text{GDP},$$

where ξ is the weight on the GDP. Then, the virtual goal function of the coalition (Eq. (16)) becomes

$$\max_{n_m \in [0, n_f]} [\lambda(1-\gamma) + \xi] n_m \pi_m(n_m, \tau) + \left[(1-\gamma\overline{\lambda}) + \xi\right] n_h \pi_h(n_m, \tau)$$

which is still a linear sum of $n_m\pi_m(n_m, \tau)$ and $n_h\pi_h(n_m, \tau)$; therefore, the preference polarization result remains valid although the threshold value $\tilde{\lambda}^s(\tau)$ is changed.

In the benchmark model, tax revenue and lobby contribution are treated as two equally weighted additive components in the goal function of the provincial government. Although this assumption is standard in the literature (see Grossman and Helpman, 1996), it is not entirely realistic because the willingness or capability of the local government to divert these two different revenue sources can be different. To capture this asymmetry in the simplest way, we generalize the local government goal function (12) as follows

$$\varkappa(1-\gamma)\left[n_m \pi_m\left(n_m, \tau\right) + \overline{\lambda} n_h \pi_h\left(n_m, \tau\right)\right] + D(\phi; \lambda, \tau)$$

where the weight on the tax revenue $\varkappa$ can be different from unity. $\varkappa$ may reflect the relative difficulty or willingness of diverting these two different revenue sources. Then, the new effective post-lobby goal function after combining Eq. (13) becomes

$$\varkappa(1-\gamma)\lambda n_m \pi_m(n_m, \tau) + \left[\varkappa(1-\gamma)\overline{\lambda} + 1 - \overline{\lambda}\right] n_h \pi_h(n_m, \tau)$$

which is again a linear sum of $n_m\pi_m(n_m, \tau)$ and $n_h\pi_h(n_m, \tau)$; therefore, the preference polarization result remains valid. Interestingly, however, the new threshold value $\tilde{\lambda}^s(\tau)$ now becomes

$$\left[\frac{\varkappa(1-\gamma)\overline{\lambda} + 1 - \overline{\lambda}}{\varkappa(1-\gamma)}\right] \frac{n_h\left[\pi_h(0, \tau) - n_h \pi_h\left(n_f, \tau\right)\right]}{n_f \pi_m\left(n_f, \tau\right)},$$

which decreases with $\varkappa$. Therefore, to ensure a friendly governmental attitude toward FDI, the minimum profit tax rate on foreign-investment firms declines when the tax revenue is valued more relative to the lobby contribution. This phenomenon occurs when, for example, corruption is more severely punished, making the lobby revenue more difficult to divert into the pockets of local government officials.

Now suppose the provincial government *also* wants to encourage the labor force to work in sectors with higher value-added (for example, from the numeraire sector to the sectors that produce the differentiated goods). Incorporating this motive into Eq. (12) again turns out not to affect the polarization result because the revised goal function is still a linear sum of $n_m\pi_m(n_m, \tau)$ and $n_h\pi_h(n_m, \tau)$. This is because employment in the domestic differentiated goods sector is proportional to $n_m\pi_m(n_m, \tau)$ and employment in the foreign-invested sector is proportional to $n_m\pi_m(n_m, \tau)$ according to Eqs. (4) and (6), indicating that the linearity structure is not altered when the government adds weighted employment in the differentiated sectors into its overall goal function.

What if the provincial government *also* cares about public welfare? By solving the household problem, we obtain the welfare function for an average household as follows

$$W(n_m, \tau) = L + (1-\overline{\lambda}) n_h \pi_h(n_m, \tau) + \frac{q(n_m)^{1-\theta}}{\theta - 1}, \tag{21}$$

where L is wage income, $(1-\overline{\lambda})n_h\pi_h$ is the after-tax profit of the domestic firms, and $\frac{q^{1-\theta}}{\theta-1}$ is the utility derived from the consumption of the

[19] It is different from the more restrictive concept of the truthful equilibrium in Dixit et al. (1997) and Grossman and Helpman (1994).

[20] In this case, ϕ may be modeled as the payment to the government instead of the deadweight loss.

[21] This statement is straightforward to verify using Eq. (6). However, the proof becomes even simpler if we restrict the range of exogenous parameters such that Eq. (10) is strengthened to $-\frac{n_m \pi'_m(n_m, \tau)}{\pi_m(n_m, \tau)} > 2$, indicating that a one percentage increase in total FDI results in more than two percentage decrease in the negative marginal effect of FDI on multinational firms' profits.

[22] For more formal discussions on the difference between one lobby group and multiple lobby groups, please refer to Grossman and Helpman (2001).

Dixit–Stiglitz aggregate. The profits of the domestic firms decrease with FDI n_m by Eq. (7), but $\frac{q(n_m)^{1-\theta}}{\theta-1}$ increases in n_m because consumers prefer that all foreign goods are produced by foreign-invested firms instead of being imported given the higher import price. It turns out that $\frac{\partial W(n_m,\tau)}{\partial n_m}>0$ for any $n_m\in[0,n_f]$.[23] Therefore, if the government is sufficiently benevolent in the sense that it places sufficiently large weight on the public welfare in its goal function, then the demand for FDI is again a corner solution $n_m^d=n_f$.

Of course, no theoretical result can hold under all circumstances. For example, if the welfare weight in the last example is sufficiently small but not too small, then we may lose the polarization result. The welfare weight will be discussed further in the first-stage lobby game, where we can show that an increase in the weight on $W(n_m,\tau)$ in the central government's goal function may in fact decrease the equilibrium FDI in some circumstances, although $\frac{\partial W(n_m,\tau)}{\partial n_m}>0$.

Proposition 1 shows that the equilibrium outcome depends on λ and τ, which are determined in the first-stage lobby game between the SIG and the central government. Next, we study this first-stage lobby game.

3.6. Fiscal decentralization

The central government maximizes the weighted sum of its total revenues and public welfare by selecting the profit tax rate on the foreign-invested firms λ and the tariff rate τ. The revenue has three parts. The first part is the tariff revenue given by

$$A(n_m,\tau)=(\tau-1)\varepsilon w^{1-\varepsilon}\tau^{-\varepsilon}\left(n_f-n_m\right)\pi_m(n_m,\tau), \tag{22}$$

which implies

$$\frac{\partial A(n_m,\tau)}{\partial n_m}<0. \tag{23}$$

This is not only because more FDI implies fewer imported foreign brands but also because the demand for each imported brand decreases as n_m increases (see Eqs. (4) and (5)). The second part is its share of total profit tax revenue $\gamma\left[\lambda n_m\pi_m(n_m,\tau)+\overline{\lambda}n_h\pi_h(n_m,\tau)\right]$. The third part is the political contribution $C(\lambda,\tau)$. Because the SIG despises FDI, $C(\lambda,\tau)$ is non-decreasing in λ. By suppressing $n_m(\phi,\lambda,\tau)$ to n_m, we can write the problem of the central government as

$$\max_{\lambda\in[0,1],\tau\in[1,\infty)} V_c(\lambda,\tau)\equiv A(n_m,\tau)+\gamma[\lambda n_m\pi_m(n_m,\tau)+\overline{\lambda}n_h\pi_h(n_m,\tau)]+C(\lambda,\tau)+aW(n_m,\tau) \tag{24}$$

where $a\in[0,\infty)$ is the welfare weight. For the central government, more FDI implies lower tariff revenue $A(n_m,\tau)$ due to Eq. (23), lower profit tax revenues from the domestic firms $\overline{\lambda}n_h\pi_h(n_m,\tau)$ due to Eq. (7) and lower political contribution $C(\lambda,\tau)$. However, more FDI also implies more profit tax revenues from multinational firms $\lambda n_m\pi_m(n_m,\tau)$ and a higher public welfare $W(n_m,\tau)$. Without a lobby, the central government has the following reservation value

$$B_c\equiv\max_{\lambda,\tau}A(n_m,\tau)+\gamma\left[\lambda n_m\pi_m(n_m,\tau)+\overline{\lambda}n_h\pi_h(n_m,\tau)\right]+aW(n_m,\tau).$$

Foreseeing the optimal response functions $\hat{\phi}^*(\lambda,\tau)$ and $D^*(\phi;\lambda,\tau)$ in the second-stage lobby game, the SIG in this first stage recommends the profit tax rate $\hat{\lambda}$ and gross tariff rate $\hat{\tau}$ and selects the lobby function $C(\lambda,\tau)$ to maximize the net gain

$$\max_{\hat{\lambda}\in[0,1],\hat{\tau}\in[0,1),C(\lambda,\tau)\geq 0}(1-\overline{\lambda})n_h\pi_h\left(n_m\left(\hat{\phi}^*,\hat{\lambda},\hat{\tau}\right),\hat{\tau}\right)-C\left(\hat{\lambda},\hat{\tau}\right)-D^*\left(\hat{\phi}^*;\hat{\lambda},\hat{\tau}\right), \tag{25}$$

subject to the incentive compatibility constraint $(\hat{\lambda},\hat{\tau})\in\arg\max_{\lambda,\tau}V_c(\lambda,\tau)$ and the participation constraint $V_c(\hat{\lambda},\hat{\tau})\geq B_c$. Again, given the transferable utility, Eqs. (24) and (25) can be combined to form

$$\begin{aligned}\max_{\hat{\lambda}\in[0,1],\hat{\tau}\in[1,\infty)}\ & A(n_m,\hat{\tau})+\gamma\left[\hat{\lambda}n_m\pi_m(n_m,\hat{\tau})+\overline{\lambda}n_h\pi_h(n_m,\hat{\tau})\right]\\ &+(1-\overline{\lambda})n_h\pi_h(n_m,\hat{\tau})+aW(n_m,\hat{\tau})-D^*\left(\hat{\phi}^*;\hat{\lambda},\hat{\tau}\right),\end{aligned} \tag{26}$$

where $n_m=n_m\left(\hat{\phi}^*;\hat{\lambda},\hat{\tau}\right)$ (determined by Eq. (11)) and $D^*\left(\hat{\phi}^*;\hat{\lambda},\hat{\tau}\right)$ is given by Lemma 1.

The central government knows that, ultimately, n_m will be either zero or n_f (according to Proposition 1); therefore, it only compares the coalition's largest value at $n_m=0$, denoted by R_1, and its largest value at $n_m=n_f$, denoted by R_2. The central government will choose to implement the full-FDI equilibrium if and only if $R_2\geq R_1$. Next, we first characterize R_1 and R_2 respectively, and then provide the necessary and sufficient condition for $R_2\geq R_1$, which points to the importance of fiscal decentralization as is summarized in Proposition 4. To simplify the notations, we will write ϕ, λ, τ, instead of $\hat{\phi}^*$, $\hat{\lambda}$, $\hat{\tau}$ whenever no confusion arises.

3.6.1. No-FDI outcome

Substituting $n_m=0$ into Eq. (26) yields $R_1=\max_{\lambda,\tau}A(0,\tau)+(\gamma\overline{\lambda}+1-\overline{\lambda})n_h\pi_h(0,\tau)+aW(0,\tau)-D^*(\phi;\lambda,\tau)$, subject to λ and τ such that $n_m=0$ will be implemented. There are two possibilities: either the SIG pays nothing to the provincial government because it is unnecessary to lobby, or the SIG pays and the lobby successfully reverses the attitude of the provincial government toward FDI. Let R_{11} and R_{12} denote the values for the virtual coalition in these two scenarios respectively.

$$R_{11}\equiv\max_{\lambda,\tau}A(0,\tau)+(\gamma\overline{\lambda}+1-\overline{\lambda})n_h\pi_h(0,\tau)+aW(0,\tau)$$

subject to $\lambda>1-w^{1-\varepsilon}\tau^{-\varepsilon}$, or $\lambda<\tilde{\lambda}(\tau)$. The optimal tariff rate τ^* is given by

$$\tau^*\in\arg\max_{\tau\in[1,\infty)}A(0,\tau)+(\gamma\overline{\lambda}+1-\overline{\lambda})n_h\pi_h(0,\tau)+aW(0,\tau), \tag{27}$$

which implies the generic uniqueness of τ^* and $\frac{\partial\tau^*(\gamma)}{\partial\gamma}>0$ because of Eq. (9). The optimal profit tax rate is indeterminate:

$$\lambda^*\in\left[1-w^{1-\varepsilon}\tau^{*-\varepsilon},1\right)\cup\left[0,\tilde{\lambda}(\tau^*)\right), \tag{28}$$

which is obvious by revoking Proposition 1.R_{12} is obtained only when $D(\phi;\lambda,\tau)>0$, that is, the effective lobby occurs. By Lemma 1, Eq. (26) can be rewritten as

$$\begin{aligned}R_{12}\equiv\max_{\lambda,\tau}\ & A(0,\tau)+aW(0,\tau)+n_h\pi_h(0,\tau)\\ &-(1-\gamma)\left[\lambda n_f\pi_m\left(n_f,\tau\right)+\overline{\lambda}n_h\pi_h\left(n_f,\tau\right)\right]\end{aligned}$$

subject to

$$\tilde{\lambda}\leq\lambda\leq 1-w^{1-\varepsilon}\tau^{-\varepsilon}\ \text{ and }\ \lambda<\tilde{\lambda}^s. \tag{29}$$

[23] The other two useful properties are $\frac{\partial W(n_m,\tau)}{\partial\tau}<0$ for any $n_m<n_f$ and $\frac{\partial W(n_f,\tau)}{\partial\tau}=0$.

Thus $\lambda^* = \tilde{\lambda}$ and $R_{12} = \max_{\tau\in[1,\infty)} A(0,\tau) + aW(0,\tau) + n_h\pi_h(0,\tau)\left[1-(1-\gamma)\overline{\lambda}\right]$ subject to $\overline{\lambda} \le \eta(\tau)$, where

$$\eta(\tau) \equiv \frac{n_f\left[\pi_m\left(n_f,\tau\right) - \pi_f\left(n_f,\tau\right)\right]}{n_h\left[\pi_h(0,\tau) - \pi_h\left(n_f,\tau\right)\right]}. \tag{30}$$

$R_1 = \max\{R_{11}, R_{12}\}$. Obviously $R_1 = R_{11}$. In addition, since $D(\phi;\lambda,\tau) = 0$ whenever $n_m = n_f$, we have the following important result.

Proposition 2. *For any equilibrium policy profile $(\phi^*, \lambda^*, \tau^*)$ and lobby functions $C^*(\lambda,\tau)$ and $D^*(\phi;\lambda,\tau)$, whenever $D^*(\phi^*,\lambda^*,\tau^*) > 0$, there always exists another equilibrium policy profile $(\phi^{**},\lambda^{**},\tau^{**})$ with the same lobby functions such that the same market allocation is achieved and $D^*(\phi^{**},\lambda^{**},\tau^{**}) = 0$.*

This proposition implies that, without loss of generality, the SIG only "effectively" lobbies the central government by setting $D(\phi;\lambda,\tau) = 0$. Observe that $D(\phi;\lambda,\tau) > 0$ holds only when the provincial government wants to encourage FDI before being lobbied but its attitude swings after being lobbied, in which case the equilibrium FDI is zero. However, the SIG could have chosen to withdraw all lobby contributions to the provincial government. Instead, it can slightly increase its lobby contribution to the central government and only ask the latter to adopt the same τ but a restrictively high λ (for example, let $\lambda = 1$). The equilibrium FDI, tariff rate, and profit tax revenues are all the same as before, so the central government accepts the new lobby suggestion.

The two government levels have asymmetric abilities to affect the equilibrium FDI, which is the fundamental reason why, in this model, the SIG can harmlessly restrict its own choice of lobby functions such that the local government is never paid in the equilibrium. The central government can effectively block FDI without any cooperation from the local government because the local government has limited ability to encourage FDI, as we restrict $\phi \ge 0$. When λ is set high enough, the provincial government actually wants as much FDI as possible, but the best it can do is set $\phi = 0$, which is still not enough to encourage FDI supply. If the provincial government is allowed to subsidize FDI (let $\phi < 0$), then the SIG may have to pay some money to the provincial government to fully block FDI. However, even in this case, the local government has to find it worthwhile to sacrifice some of its fiscal resources to act against the central government and the SIG. In reality, this situation is quite rare, especially when the central government is strong, such as it is in China and India.

This proposition highlights a distinctive feature of the sequential lobbying within a multi-level government: the lobby strategy of the SIG has to take into account the strategic interaction between the different levels of government. The SIG would be naive if it only attempts to lobby the provincial government although the latter seems to be able to block FDI single-handedly by choosing a prohibitively high ϕ. In our model, it is actually more efficient for the SIG to lobby the provincial government "indirectly" by only lobbying the central government because the latter can manipulate the incentive of the local government. This proposition also greatly simplifies the calibration exercise in Section 4.

To summarize, we have

Lemma 2. *In any no-FDI equilibrium, the coalition of the central government and the special interest group obtains $R_1 \equiv \max_{\tau\in[1,\infty)} A(0,\tau) + \left(\gamma\overline{\lambda} + 1 - \overline{\lambda}\right)n_h\pi_h(0,\tau) + aW(0,\tau)$, the optimal tariff rate is given by Eq. (27) and the optimal profit tax rate is indeterminate, given by Eq. (28).*

However, Proposition 2 does not mean that the second-stage lobby game is unimportant. The fact that the SIG has the ability to lobby the provincial government always imposes a potential "threat" to the central government. In particular, when the central government wants FDI, it has to ensure local government cooperation. We turn to this case now.

3.6.2. Full-FDI outcome

In any full-FDI equilibrium, no foreign brand is imported; hence the tariff revenue is zero ($A(n_f,\tau) = 0$). In addition, the SIG has rational expectations so it does not waste money lobbying the provincial government ($D(\phi;\lambda,\tau) = 0$). Therefore, the goal function (26) is reduced to

$$R_2 \equiv \max_{\lambda,\tau} \gamma\left[\lambda n_f\pi_m\left(n_f,\tau\right) + \overline{\lambda}n_h\pi_h\left(n_f,\tau\right)\right] + (1-\overline{\lambda})n_h\pi_h\left(n_f,\tau\right) + aW\left(n_f,\tau\right)$$

subject to $\tilde{\lambda}^S(\tau) \le \lambda \le 1 - w^{1-\varepsilon}\tau^{-\varepsilon}$. as implied by Eq. (19) in Proposition 1. It implies equilibrium profit tax rate $\lambda^* = 1 - w^{1-\varepsilon}\tau^{-\varepsilon}$. Substituting this equation back yields

$$R_2 = \max_{\tau\ge 1} \gamma n_f\left[\pi_m\left(n_f,\tau\right) - \pi_f\left(n_f,\tau\right)\right] + (1-\overline{\lambda}+\gamma\overline{\lambda})n_h\pi_h\left(n_f,\tau\right) + aW\left(n_f,\tau\right). \tag{31}$$

subject to

$$\frac{1-\gamma\overline{\lambda}}{1-\gamma} \le \eta(\tau), \tag{32}$$

where $\eta(\tau)$ is defined in Eq. (30). Eq. (32) combines the incentive-compatibility constraints for both the provincial government (demand side) and the foreign firms (supply side), so it is the implementability constraint for the full-FDI equilibrium.

Observe that $\pi_m(n_f,\tau)$, $\pi_h(n_f,\tau)$ and $W(n_f,\tau)$ are all independent of τ, because tariff rate matters only when exporting firms exist. Nevertheless, the shadow profit for a "potential" exporting firm $\pi_f(n_f,\tau)$ is still decreasing in τ because of the law of demand. Consequently, the optimal tariff rate must be the largest possible value that satisfies the implementability constraint (32):

$$\tau^* = \sup\left\{\tau | \tau\in[1,\infty) \text{ and } \frac{1-\gamma\overline{\lambda}}{1-\gamma} \le \eta(\tau) \text{is satisfied}\right\}. \tag{33}$$

To provide a sharper characterization of τ^*, we describe the following properties of function $\eta(\tau)$.

[1] $\eta(\tau)$ is strictly positive and continuously differentiable for any $\tau\in[1,\infty)$.
[2] $\eta'(\tau) < 0$ when $\tau \ge \hat{\tau}$, where $\hat{\tau} \equiv \frac{\varepsilon}{\varepsilon-\theta}\frac{1-\left[1+\frac{n_f}{n_h}\left(\frac{c_f}{c_h}\right)^{1-\varepsilon}\right]^{\frac{\varepsilon-\theta}{1-\varepsilon}}}{\frac{n_f}{n_h}\left(\frac{c_f}{c_h}\right)^{1-\varepsilon}} > 0$.[24]
[3] $1 < \eta(\infty) < \infty$ and $0 \le \eta(1) < \infty$.[25]
[4] When $\tau\in[1,\hat{\tau}]$, $\eta'(\tau) < 0$ if and only if τ is larger than some critical value and $\eta''(\tau) < 0$ when τ is smaller than that critical value.[26]

[24] $\eta'(\tau) < 0$ is equivalent to $\frac{-\pi'_{f2}(n_f,\tau)}{\pi'_{h2}(0,\tau)} < \frac{\pi_m(n_f,\tau)-\pi_f(n_f,\tau)}{\pi_h(0,\tau)-\pi_h(n_f,\tau)}$ for any $\tau \ge \hat{\tau}$, (with "=" only when $\tau = \hat{\tau}$). It means that when the trade barrier is sufficiently large ($\tau > \hat{\tau}$) and the FDI is full, the ratio of each investor's profit gain by shifting from exporting to FDI, $\pi_m(n_f,\tau) - \pi_f(n_f,\tau)$, to each domestic firm's profit loss due to full FDI, $\pi_h(0,\tau) - \pi_h(n_f,\tau)$ is larger than the ratio of the marginal decrease in each exporting firm's profit due to a tariff increase ($-\pi'_{f2}(n_f,\tau)$) to the marginal increase in each domestic firm's profit due to a tariff increase ($\pi'_{h2}(0,\tau)$). Or roughly, the right hand side measures the gain of an investor relative to the loss of a domestic firm while the left hand side measures the marginal loss in an exporter's profit relative to the marginal gain in a domestic producer's profit as the tariff rate changes.

[25] $\eta(\infty) > 1$ is equivalent to $n_f\pi_m(n_f,\infty) > n_h[\pi_h(0,\infty) - \pi h(nf,\infty)]$, which can be verified by revoking Eq. (6). It means that the total profit of all the foreign-invested firms with full FDI exceeds the total profit loss of all the domestic firms with full FDI.

[26] More precisely, when $\tau \in [1, \hat{\tau}]$, we can show $\eta''(\tau) < 0$ if and only if $(\varepsilon-\theta)\tau^{\varepsilon} + (\varepsilon-\theta)(2\varepsilon-\theta)w^{1-\varepsilon}\frac{n_f}{n_h}\left(\frac{c_f}{c_h}\right)^{1-\varepsilon}\tau - (2\varepsilon-\theta-1)\varepsilon w^{1-\varepsilon} > 0$, thus, the cutoff value can be uniquely determined. In particular, $\eta''(\tau) < 0$ for any $\tau \in [1, \hat{\tau}]$ when $\frac{n_f}{n_h}\left(\frac{c_f}{c_h}\right)^{1-\varepsilon} > \frac{w^{1-\varepsilon}\varepsilon(2\varepsilon-\theta-1)-(\varepsilon-\theta)}{w^{1-\varepsilon}(\varepsilon-\theta)-(2\varepsilon-\theta)}$.

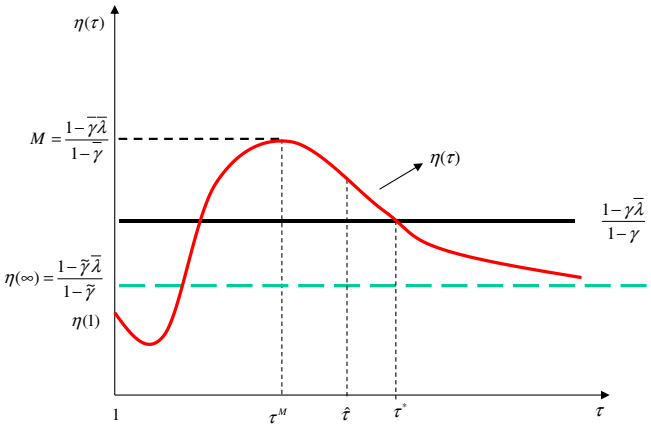

Fig. 2. Properties of $\eta(\tau)$ and determination of tariff rate τ.

These properties immediately imply that there exists a finite maximum value for $\eta(\tau)$, denoted by M, which can be obtained at some $\tau\in(1,\hat{\tau})$. For future reference, define

$$\tau^M\equiv\max\{\arg\max\eta(\tau)\};\overline{\gamma}\equiv\frac{M-1}{M-\overline{\lambda}};\tilde{\gamma}\equiv\frac{\eta(\infty)-1}{\eta(\infty)-\overline{\lambda}}. \tag{34}$$

We must have $M>\eta(\infty)$. These are illustrated in Fig. 2.

Geometrically, Eq. (32) means that the curve $\eta(\tau)$ in Fig. 2 must be above the solid straight line with intercept $\frac{1-\gamma\overline{\lambda}}{1-\gamma}$ for that specific τ. Eq. (32) also implies that the full-FDI equilibrium is possible only when the fiscal centralization $\gamma\le\overline{\gamma}$; otherwise, the SIG can fully capture the provincial government in the sense that the minimum profit tax rate to induce a positive government demand for FDI is still larger than the maximum profit tax rate that any potential investor could tolerate.

The optimal tariff rate can be determined by Eq. (33). Notice that, when $\tau=\infty$ (i.e., import is prohibited), $\eta(\infty)>\frac{1-\gamma\overline{\lambda}}{1-\gamma}$ holds when fiscal decentralization is strong enough ($\gamma<\tilde{\gamma}$). In other words, there exists a full-FDI equilibrium with complete import embargo when $\gamma<\tilde{\gamma}$.

Correspondingly,

$$R_2=\gamma n_f\pi_m\left(n_f,\infty\right)+(1-\overline{\lambda}+\gamma\overline{\lambda})n_h\pi_h\left(n_f,\infty\right)+aW\left(n_f,\infty\right). \tag{35}$$

The other possibility of achieving full-FDI equilibrium is when $\gamma\in[\tilde{\gamma},\overline{\gamma})$; therefore, Eq. (32) must be binding and the optimal tariff rate is

$$\tau^*(\gamma)=\max\left\{\tau|\mu(\tau)=\frac{1-\gamma\overline{\lambda}}{1-\gamma}\right\}. \tag{36}$$

Geometrically, the equilibrium tariff τ^* must be the far right crossing point of curve $\eta(\tau)$ and the straight solid line in Fig. 2. Moreover, an increase in γ will move up the straight solid line, and hence, the crossing point τ^* will move leftward, indicating that $\frac{\partial\tau^*(\gamma)}{\partial\gamma}<0$. Once τ^* is determined, the equilibrium profit tax rate is also pinned down: $\lambda^*=1-w^{1-\varepsilon}\tau^{*-\varepsilon}$. Substituting λ^* and $\tau^*(\gamma)$ back into Eq. (31) yields

$$\begin{aligned}R_2=&\frac{\gamma(1-\gamma\overline{\lambda})}{1-\gamma}n_h\left[\pi_h(0,\tau^*(\gamma))-\pi_h\left(n_f,\tau^*(\gamma)\right)\right]\\&+(1-\overline{\lambda}+\gamma\overline{\lambda})n_h\pi_h\left(n_f,\tau^*(\gamma)\right)+aW\left(n_f,\tau^*(\gamma)\right).\end{aligned} \tag{37}$$

In summary, we have

Lemma 3. *The full-FDI equilibrium is possible only when fiscal decentralization is sufficiently strong ($\gamma\le\overline{\gamma}$). In addition, if fiscal decentralization satisfies $\gamma<\tilde{\gamma}$, the total surplus of the central government and the SIG R_2 is given by Eq. (35), the equilibrium tariff rate is infinity, and the equilibrium profit tax rate is one (full taxation). If fiscal decentralization is "moderately" strong ($\gamma\in(\tilde{\gamma},\overline{\gamma}]$), R_2 is given by Eq. (37), the tariff rate is given by Eq. (36) and the profit tax rate is $\lambda^*=1-w^{1-\varepsilon}\tau^{*-\varepsilon}$.*

3.6.3. Equilibrium outcome

The full-FDI equilibrium will be implemented if and only if $R_2\ge R_1$. Lemma 2 and Lemma 3 yield

$$\begin{aligned}R_2-R_1=&\frac{\gamma(1-\gamma\overline{\lambda})}{1-\gamma}n_h\left[\pi_h(0,\tau_2^*)-\pi_h\left(n_f,\tau_2^*\right)\right]\\&+(1-\overline{\lambda}+\gamma\overline{\lambda})n_h\left[\pi_h\left(n_f,\tau_1^*\right)-\pi_h(0,\tau_1^*)\right]\\&+a\left[W\left(n_f,\tau_1^*\right)-W(0,\tau_1^*)\right]-A(0,\tau_1^*),\end{aligned} \tag{38}$$

where τ_1^* and τ_2^* denote the optimal tariff rates for R_1 and R_2, respectively.

First, consider the limit case when the central government is fully benevolent by only maximizing welfare (that is, $a\to\infty$ for Eq. (38)). The properties of the welfare function (21) imply the following:

Proposition 3. *Suppose the central government is fully benevolent (only to maximize welfare). The equilibrium FDI (technology adoption) is full ($n_m{}^*=n_f$) if and only if $\gamma\le\overline{\gamma}$, in which case institutional entry cost ϕ^*, tariff rate τ^*, and profit tax rate λ^* are all indeterminate as long as the following condition is satisfied*

$$\tilde{\lambda}^s(\tau^*)\le\lambda^*\le\frac{\pi_m\left(n_f,\tau^*\right)-\pi_f\left(n_f,\tau^*\right)-\phi^*}{\pi_m\left(n_f,\tau^*\right)}, \tag{39}$$

where $\tilde{\gamma}$ is given in Eq. (34), $\tilde{\lambda}^s(\cdot)$ is given by Eq. (17), and profit functions $\pi_x(\cdot,\cdot)$ are given by Eq. (6) for any $x\in\{h,m,f\}$. When $\gamma>\overline{\gamma}$, the equilibrium FDI (technology adoption) is none ($n_m{}^*=0$) with equilibrium policy profile (ϕ^*,π^*,λ^*) completely indeterminate.

This proposition states that, although the full-FDI outcome is welfare-maximizing, a fully benevolent central government is still unable to implement this socially desirable equilibrium when the economy is too fiscally centralized ($\gamma>\overline{\gamma}$). It is because the local government will be fully captured by the SIG at any policy profile that can induce a positive supply of FDI, as previously explained. In contrast, when $\gamma\le\overline{\gamma}$, the central government will be able to implement this socially desirable outcome. However, the equilibrium policies are not necessarily the same as specified in Lemma 3 because now the central government no longer cares about tax revenue per se, as long as FDI is full. Similar to Proposition 1, the left inequality in Eq. (39) ensures a friendly attitude of the local government toward FDI whereas the right inequality ensures that all potential foreign investors prefer making FDI to exporting.

Next, consider the other extreme case when $a=0$. Define $\Delta(\gamma)\equiv R_2-R_1$ for all $\gamma\in[0,\overline{\gamma}]$ when $a=0$.

Lemma 4. *$\Delta(\gamma)$ is continuous and strictly increasing on $[0,\overline{\gamma}]$.*

The proof is in Appendix B-I(a). Notice that $\Delta(0)<0$; therefore, the central government would fully block FDI when it obtains no profit tax revenue. When $\Delta(\overline{\gamma})\le0$, the no-FDI equilibrium will be sustained for any γ. To avoid this trivial and unrealistic case, we focus on the more relevant parameter space such that

$$\Delta(\overline{\gamma})>0. \tag{40}$$

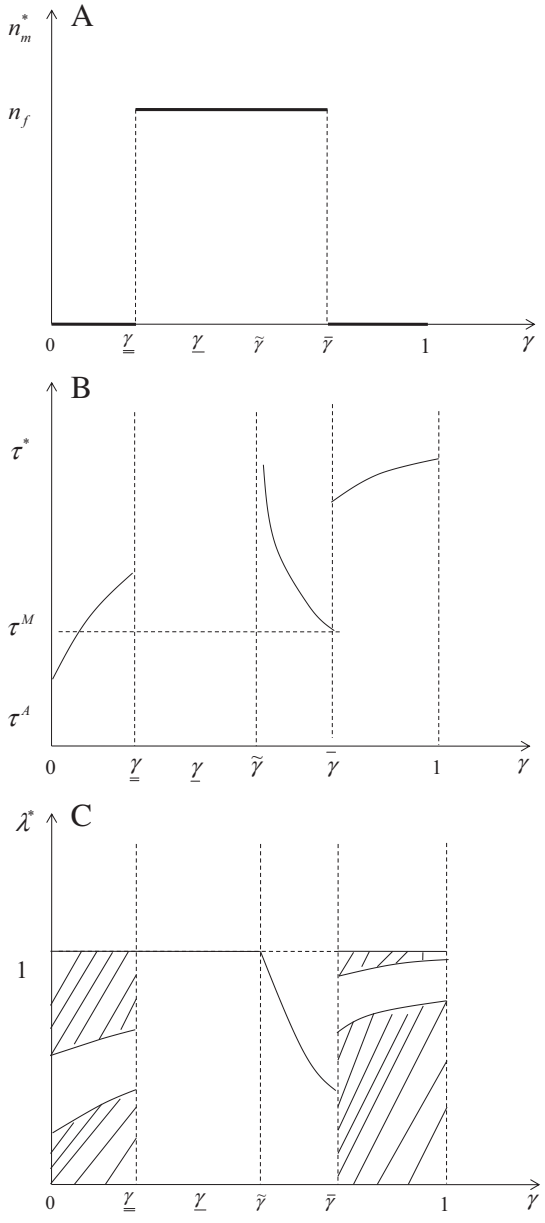

Fig. 3. a. Equilibrium FDI vs. fiscal centralization when $\Delta(\tilde{\gamma})\geq 0$. b. Equilibrium tariff rate vs. fiscal centralization when $\Delta(\tilde{\gamma})\geq 0$. c. Equilibrium profit tax rate vs. fiscal centralization when $\Delta(\tilde{\gamma})\geq 0$.

Then, the mean value theorem implies the existence of a unique cut-off value $\hat{\gamma}\in(0,\overline{\gamma})$ such that $R_2-R_1>0$ when $\gamma\in(\hat{\gamma},\overline{\gamma})$ and $R_2-R_1>0$ when $\gamma\in[0,\ \hat{\gamma})$. In particular, if $\Delta(\tilde{\gamma})\geq 0$, or, equivalently,

$$\tilde{\gamma}n_f\pi_m\left(n_f,\infty\right)+(1-\overline{\lambda}+\tilde{\gamma}\overline{\lambda})n_h\left[\pi_h\left(n_f,\infty\right)-\pi_h(0,\tau_1^*(\tilde{\gamma}))\right]-A(0,\tau_1^*(\tilde{\gamma}))\geq 0, \tag{41}$$

where $\tau_1^*(\tilde{\gamma})$ is given by Eq. (27) at $a=0$ and $\gamma=\tilde{\gamma}$, then $\hat{\gamma}=\underline{\underline{\gamma}}\in(0,\tilde{\gamma}]$ where $\underline{\underline{\gamma}}$ is uniquely determined by $\Delta(\ \gamma)=0$. When Eq. (41) is not satisfied, $\hat{\gamma}=\underline{\gamma}\in(\tilde{\gamma},\overline{\gamma}]$, where $\underline{\gamma}$ is uniquely pinned down by $\Delta(\underline{\gamma})=0$. To summarize, we have

Proposition 4. Non-monotonicity

Suppose the welfare weight a is zero and Eq. (40) holds. The equilibrium policies are sufficiently favorable and the equilibrium FDI (technology adoption) is full ($n_m^*=n_f$) if and only if the fiscal decentralization is in the medium range ($\gamma\in[\hat{\gamma},\overline{\gamma}]$), as summarized in Lemma 3. Otherwise, the equilibrium policies discourage FDI and the equilibrium FDI is zero, as summarized in Lemma 2.

This proposition shows that there exists a non-monotonic relationship between fiscal decentralization and the equilibrium FDI due to endogenous policy changes. Too much fiscal decentralization hurts the central government's incentive to attract FDI; therefore, the central government chooses policies to induce the provincial government to block FDI instead of competing for it. This explains why the Tiebout effect may not work. On the other hand, too little fiscal decentralization renders the provincial government captured by the anti-FDI SIG. Therefore, the economy reaches the full-FDI equilibrium if and only if fiscal decentralization is at a medium range. The two endogenous cutoff values, $\hat{\gamma}$ and $\overline{\gamma}$, depend on economic fundamentals and, thus, may vary by countries. In particular, when γ decreases slightly across the threshold $\hat{\gamma}$ from above, this tiny increase in fiscal decentralization could dramatically shift the equilibrium from full FDI to no FDI. Moreover, both GDP and public welfare would decrease. This result is in sharp contrast with the traditional Tiebout effect, although the latter is nothing but a special case in our model.

There are two possible types of political equilibria depending on whether Eq. (41) holds. However, the equilibrium FDI is unique once the exogenous parameters are given. Fig. 3a–c plots the case for which Eq. (41) holds.[27]

Fig. 3a plots the equilibrium FDI n_m^* as a function of the fiscal centralization parameter γ. The intuition for this non-monotonicity was just explained. The equilibrium FDI does not change when γ moves within the "inaction interval." This helps explain why fiscal reform does not always dramatically affect FDI (for example, China's fiscal reform in 1994 did not seem to have a significant effect on the FDI inflow). The equilibrium FDI "jumps" only when fiscal decentralization moves to different regimes. In terms of equilibrium policies, the entry cost ϕ^* can be any value satisfying $\phi^*>(1-\lambda^*)\pi_m(0,\tau^*)-\pi_f(0,\tau^*)$ whenever n_m^* is zero. ϕ^* must be zero when $n_m^*=n_f$, which is implied by Lemma 1 and Lemma 3.

Fig. 3b shows how the equilibrium tariff rate changes with fiscal centralization. When $\gamma\notin[\underline{\underline{\gamma}},\overline{\gamma}]$, the equilibrium tariff rate is determined by Eq. (27), therefore, τ^* is strictly increasing in γ because a higher γ makes the profit tax revenue from domestic firms more attractive to the central government vis-a-vis the tariff revenue, meaning that the central government increases the tariff rate to increase domestic firms' profits, which the SIG also prefers, even though the tariff revenue decreases. When $\gamma\notin[\underline{\underline{\gamma}},\overline{\gamma}]$, the optimal tariff rate is infinity, which drives the tariff revenue down to zero; however, the central government collects more profit tax revenues from the domestic firms and also obtains more lobby revenue when γ increases. Condition (41) ensures that the increase in the profit tax revenue and the lobby revenue dominate the decrease in tariff revenue. When $\gamma\in[\tilde{\gamma},\overline{\gamma}]$, the optimal tariff rate decreases with fiscal centralization because the provincial government becomes more vulnerable to lobbying as γ increases; therefore, to implement the full-FDI equilibrium, the central government must lower the threshold value $\tilde{\lambda}^s(\tau)$ to induce the provincial government to encourage FDI. This can be achieved by reducing the tariff rate (to lower the profits of the domestic firms) to ensure that the lobbying power of the SIG is weakened. Furthermore, the profit tax revenue from domestic firms also becomes less attractive. Recall from Fig. 2 that τ^M is a tariff rate that can accommodate the largest possible γ for the full-FDI equilibrium. In extreme decentralization ($\gamma=0$), the optimal tariff rate is higher than τ^A, which is defined as the tariff rate that maximizes tariff revenue $A(0,\tau)$. The tariff rate jumps both at $\gamma=\underline{\underline{\gamma}}$ and $\gamma=\overline{\gamma}$ because the

[27] When Eq. (41) is not satisfied, the tariff revenue is sufficiently large, indicating that the tariff rate must be finite in any full-FDI equilibrium. See Figs. A2(a)–A2(c) in Appendix B-I(b).

central government changes the target equilibrium it wants to implement.

Fig. 3c shows how the equilibrium profit tax rate changes with fiscal centralization. The equilibrium FDI is zero when $\gamma \notin [\underline{\gamma}, \overline{\gamma}]$, in which case λ^* is indeterminate (denoted by the shaded regions). This indetermination occurs because the no-FDI equilibrium occurs either when the provincial government blocks FDI (when λ^* is too small) or when no investor makes FDI (when λ^* is too large). When $\gamma \in [\underline{\gamma}, \tilde{\gamma}]$, there is an import embargo and all of the profits of multinational firms are fully taxed away ($\lambda^* = 1$) so that each potential foreign investor is indifferent between making FDI and exporting. When $\gamma \in [\tilde{\gamma}, \overline{\gamma}]$, τ^* strictly decreases with γ. Therefore, λ^* has to decrease; otherwise, the option for exporting becomes more attractive for potential investors.

For the more general case in which $a \in (0, \infty)$, we have to resort to numerical methods to fully characterize this general-equilibrium structural model. However, the FDI polarization result still holds because it is primarily driven by local government behavior. Whether the economy has full FDI or no FDI in equilibrium depends on the value of a in a nontrivial manner. As Section 4 shows, an increase in a may sometimes shift the economy from the full-FDI equilibrium to the no-FDI equilibrium, even though the welfare function (Eq. (21)) strictly increases in FDI. The explanation is deferred to Section 4.

3.7. Further discussion on robustness of results

3.7.1. Multiple-province economy

The two main results, FDI polarization and non-monotonicity, remain valid when the economy has multiple provinces. It is easy to understand because the main economic forces that deliver these two results are not changed. The Tiebout effect works only when at least two provincial governments want more FDI and when the central government encourages FDI inflows. These conditions are satisfied only when fiscal decentralization is in some proper middle range, enabling both the central government and local governments to benefit enough from FDI to resist lobbying from domestic firms. Otherwise, regional governments do not enthusiastically compete for FDI despite fiscal decentralization, as was observed in India. A full specification and characterization of the multiple-province model becomes much more complicated and, therefore, it is included in Appendix B-II.[28]

3.7.2. Alternative timing of the political game

Apart from being more realistic and tractable, the current setting of the sequential lobbying game has another important benefit: the uniqueness of the equilibrium *outcome* for FDI.[29] For technical curiosity, suppose nothing is changed except that the political game is reformulated with a normal-form representation in which lobbying occurs simultaneously at both the central and local government levels. Then, the equilibrium outcome derived in the previous extensive-form game continues to be a Nash equilibrium outcome in the new game. However, there may exist multiple Nash equilibrium outcomes, in which case the model prediction becomes less sharp. Also, observe that this model excludes the possibility of direct fiscal transfers between the central and local governments; therefore, even if a grand coalition is formed comprised of the SIG and both government levels, the exogenous fiscal centralization parameter γ still affects the equilibrium through the incentive constraints for both government levels. However, allowing for the governmental transfer together with the simultaneous multilateral coalition may be an interesting way to endogenize fiscal decentralization γ in future research.

3.7.3. Assignment of policy instruments

Although τ, λ, and ϕ are among the most important policy variables that affect the supply and demand of FDI, a much larger set of policy instruments is available to each different government level (also see Subsection 3.5). Moreover, governmental transfers across different levels need to be analyzed more explicitly to highlight the nontrivial distinction between expenditure share and revenue share, especially when dealing with issues of public good provision (see Bardhan and Mookherjee, 2000). The current model is agnostic about those details and implicitly assumes that neither level of government is financially constrained when implementing their policy choices. Section 4 empirically examines the effects of fiscal decentralization when different measures of fiscal decentralization are adopted.

3.7.4. Endogenous fiscal decentralization

How fiscal centralization γ is endogenously determined is beyond the scope of this paper but some preliminary discussion is useful. γ may be determined by the relative bargaining power distribution between the central and local governments, which in turn may depend on the electoral modes and other aspects of the political institutions. For example, China's provincial officials are essentially appointed by the central government whereas local government officials are elected by local voters in India. This institutional difference may partly explain why China has a higher centralization parameter γ. More canonically, suppose γ can be directly chosen by the central government at the very beginning while the remaining part is identical to the model described in previous sections. Then, the optimal fiscal centralization parameter, denoted by γ^*, is given by

$$\gamma^* = \begin{cases} \gamma_1^*, & \text{when} \quad R_1(\gamma_1^*) > R_2(\gamma_2^*) \\ \gamma_1^* \text{ or } \gamma_2^*, & \text{when} \quad R_1(\gamma_1^*) = R_2(\gamma_2^*) \\ \gamma_2^*, & \text{when} \quad R_1(\gamma_1^*) < R_2(\gamma_2^*) \end{cases},$$

where

$$\gamma_1^* \in \underset{\gamma_1 \in [0,\hat{\gamma}] \cup [\overline{\gamma},1]}{\arg\max} R_1(\gamma_1),$$

and

$$\gamma_2^* \in \underset{\gamma_2 \in [\hat{\gamma},\overline{\gamma}]}{\arg\max} R_2(\gamma_2).$$

It can be shown that $\gamma_1^* = 1$ and $\gamma_2^* = \overline{\gamma}$, but whether $R_1(1) > R_2(\overline{\gamma})$ depends on exogenous parameters. In particular, $\gamma^* = \overline{\gamma}$ when the full-FDI equilibrium generates the highest payoff to the central government. In contrast, when the central government is fully benevolent, then it may choose any $\gamma \in \left[0, \frac{\eta(1)-1}{\eta(1)-\lambda}\right]$ to satisfy the incentive-compatibility constraint of the local government to implement the first-best equilibrium allocation and the first-best policies, as described in Proposition 3. We need to assume $\eta(1) > 1$; otherwise, the first-best equilibrium can never be implemented. When the welfare weight $a \in (0, \infty)$, γ^* is still either 1 or $\overline{\gamma}$ depending on the value of a, which determines whether $R_1(1) > R_2(\overline{\gamma})$.

[28] The multiple-province setting becomes necessary for analyzing the regional distribution of FDI within a country. In the appendix for the multiple-province case, we show that the two main results in the single-province model are robust. In addition, the model has several other interesting results. For example, as the number of provinces increases, the interval for the fiscal centralization that supports the full-FDI equilibrium shifts downward because of the intensified inter-regional competition. Moreover, ex ante identical provinces may end up with different amounts of FDI when the pool of total potential foreign investors is not large enough. This is because each province finds it optimal to attract FDI only when the expected FDI inflow is large enough for the tax-base expansion effect to dominate the profit-reduction effect; otherwise a province prefers zero FDI.

[29] As previously shown, the equilibrium policies might be indeterminate.

4. Quantitative investigation

In this section, we conduct two simple quantitative exercises to evaluate the model using real-world data.

First, we follow the standard approach of calibration and simulation for China and India separately. An important advantage of this methodology is that it can help quantify and evaluate specific economic mechanisms country by country in a structural way without relying on cross-country data, especially given that we want to highlight a two-country comparison at the national level. To some extent, this may also help circumvent the data availability issues about cross-country de facto institutions and policies.[30] Most importantly, the "medium range" of the fiscal decentralization that admits large FDI is endogenously determined in our general-equilibrium type model and potentially varies across countries, depending on exogenous parameters such as the size of labor force, labor productivity, the welfare weight in the goal function, and the substitution elasticities between domestic and foreign goods. Recall that the model predicts a non-monotonic relationship between FDI and fiscal decentralization; thus, an increase in the degree of fiscal decentralization in the same country may increase, decrease, or, in most cases, not change the equilibrium FDI.[31] For the quantitative purpose, we report the calibration and simulation results based on a *two-province* economy model, which also allows for strategic interaction across different provinces.[32] The main results support the theoretical model quite strongly. A robustness check is conducted with respect to all parameters likely subject to sizeable measurement errors, which are included in Appendix B-III. The counterfactual experiment results also highlight the importance of "often-ignored" fiscal decentralization in explaining the FDI difference between China and India.[33]

Second, we conduct cross-country regressions to see whether the model predictions are empirically supported. We focus on the test of the non-monotonicity result by incorporating a quadratic term of fiscal decentralization and see whether it is robustly negative at a significant level when controlling various other factors such as development stage, growth rate, and political-economy measures including corruption, rule of law, and so on.[34] We find that the regression results repeatedly support our theoretical finding, which seems to suggest that the mechanism in our model is generally valid, not confined to only China and India.

4.1. Calibration and simulations

4.1.1. Data and benchmark calibration for China

We calibrate the model using China's data in 2004, the most recent year in which all the relevant data are available. The main data source is the China Statistical Yearbook (2005). The parameter choices are summarized in Table 1. Please refer to Appendix B-III for more details about how these parameters are chosen.

The key parameter γ is directly computed from the data and welfare weight a is based on Branstetter and Feenstra (2002). All these benchmark parameters in Table 1 are plugged into the two-province model to compute the political equilibrium. The simulation results predicted by the model are summarized in Table 2 together with the real data.

Table 1
Parameter choices for China (2004).

Parameters	Description	Values
γ	Central government's tax share	0.6
λ	Profit tax rate on domestic firms	0.33
$n_f{:}n_h$	# of foreign firms vs. # of domestic firms	1:6
$c_h{:}c_f$	Unit labor cost ratio	6:1
L	Total population	3
ε	Substitution elasticity	1.89
θ	Price elasticity of CES aggregate	1.8
a	Weight on average household welfare	1.302

Although none of the parameters in Table 1 are chosen to directly match any of these target endogenous variables in Table 2, we can see that the simulation results with the calibrated parameters can match the macro and policy data amazingly well. Most importantly, the computed equilibrium FDI is indeed full: $n_{m,k}^*{:}n_h$ is 1:12 instead of zero (FDI polarization result). In addition, our model predicts $\frac{lh}{lm}=\frac{n_h\pi_h}{n_{m,k}^*\pi_m}$, which is consistent with the real data because both l_h: l_m and $n_h\pi_m{:}n_{m,k}^*\pi_m$ are indeed both about 2.4:1. The predicted τ^* is higher than the data. Except for the possible measurement errors, this upward bias is partly due to the following two reasons. One is that the real tariff rate is also subject to the downward pressure from WTO after China's accession to 2001. Second, any additional real-life transaction cost in the international trade will be added to the predicted value for the tariff rate.

4.1.2. Data and benchmark calibration for India

We use the data of the 2003–2004 fiscal year for India. The parameter choices are summarized in the following Table 3.

A more detailed description about the data set and parameter choice is in Appendix B-III, but several issues deserve special attention. First, the value of substitution elasticity ε was much higher in India than in China, capturing the facts that are not explicitly modeled here. For example, a non-negligible portion of China's FDI goods serve the international market rather than China's domestic market. Also, the positive spillover by FDI (perhaps due to the vertical FDI) may be more significant in China than in India, etc. More robustness check with ε is provided in Appendix B. Second, within our knowledge there exists no empirical estimation for India's value of a in line with Grossman and Helpman (1996), so we set it equal to China's value in the benchmark calibration as a counterfactual experiment to help quantify the potential importance of fiscal decentralization without any heterogeneities. A more careful discussion on a is provided below. Third, fiscal revenues and state capacity are key issues in our model, so we must carefully adjust for the different efficiencies in the tax system, as suggested by Besley and Persson (2009) and the other aforementioned literature on FDI. Thus we introduce a new parameter s in the calibration, which is multiplied to the tariff revenue term in the goal function (Eq. (24)) of the central government. This is to capture the fact that tariff revenue is a more favored tax option in many developing economies

Table 2
Data and calibration result for China.

	$n_{m,k}^*{:}n_h$	λ^*	τ^*	$l_h{:}l_m$	GDP:$n_h\pi_h$
Data	1:6	(0.15, 0.30)	1.104	2.4:1	21.0:2.4
Model	1:6	0.2382	1.155	2.4:1	25.8:2.4

Note: $n_{m,k}^*$ denotes the equilibrium FDI in province k. Aggregate FDI in this two-province economy is thus $2n_{m,k}^*$ in the symmetric equilibrium.

[30] The availability of quality panel data, or even a simple cross-country data set, on fiscal decentralization for developing economies is very limited. Better data are available for OECD countries (see Kessing et al. (2007) for more discussions).

[31] It presumably explains why Jensen (2005) finds that fiscal federalism has no clear effect on FDI inflows because he simply regresses FDI inflows on a linear term of fiscal decentralization together with other independent variables.

[32] The calibration and simulation exercise based on the one-province model still correctly predicts the equilibrium FDI inflows for both China and India, the key point of this paper. However, the predictions for the tariff and profit tax rates are not as good as in the two-province model because of the absence of horizontal government interaction in the one-province model.

[33] Of course, we do not claim that fiscal decentralization alone can explain all policy and FDI differences between China and India. For example, India's labor market regulations and political economic issues of infrastructure undersupply could also discourage FDI inflows, reasons that are interesting but beyond the scope of this paper.

[34] The FDI polarization result of the model is to qualitatively highlight the key *mechanism* instead of quantitatively emphasizing that the equilibrium outcome of FDI is indeed either none or full.

Table 3
Parameter choices for India (2004).

Parameters	Description	Values
γ	Central government's tax share	0.38
$\overline{\lambda}$	Profit tax rate on domestic firms	0.36
n_f:n_h	# of foreign firms vs. # of domestic firms	1:6
c_h:c_f	Unit labor cost ratio	74:1
L	Total population	2:45
ε	Substitution elasticity	3.05
θ	Price elasticity of CES aggregate	1.16
a	Weight on average household welfare	1.302

because of the enforceability constraint in the informal sector, as emphasized by Gordon and Li (2009). India has a very large informal sector (or called disorganized sector in the official statistical books) and studies show that its tax system relies too much on the indirect tax and hence not very efficient. By contrast, China's tax structure has a well-developed standard VAT system, especially after the tax reform around the mid-1990s. Thus s is normalized to unity for China and set to 1.6 for India to match India's tariff revenue/GDP ratio in 2003–2004. No employment or good profit data in the foreign-invested firms is available for India in 2003–2004, so l_h:l_m:l_n and profits are not simulated. The results are presented in Table 4.

The overall performance of the model also seems to be quite satisfying. The upward bias for the tariff rate can be justified as before. The point predictions for λ_k^* cannot be made, consistent with the model: when the central government wants to block FDI, it can either charge a very high profit tax rate to discourage the supply of FDI or to stipulate an extremely low profit tax rate to induce resistance by the provincial governments. Given $\lambda_k^* > \overline{\lambda}$ in the real data, the first case is the relevant one. So the supply of FDI is effectively discouraged by the high tax rate, and the provincial governments no longer have any incentive to improve the investment environment for FDI, which deters FDI even further.

To test the model further, the same empirical strategies can be directly applied to any other years for China and India, or any other countries, as long as the data are available.

4.1.3. Counterfactual experiments

Suppose we set all the exogenous parameters identical for the two countries except that let γ match the real data for the two economies: 0.6 for China and 0.38 for India. Again the model predicts that China still has full FDI while India has no FDI. This is true no matter whether we choose the value $a = 1.302$ as in Table 2 or the value $a = 0.434$ according to Branstetter and Feentra's estimation. By contrast, if we only focus on the heterogeneity in any other parameter listed in Tables 1 or 3 while holding all the other parameters identical, we cannot obtain a better fit than the one with fiscal decentralization difference. This suggests that the difference in fiscal decentralization is at least one of the important institutional sources for the big FDI differences for that particular fiscal year.

The next experiment suggests that the large China–India FDI difference seems unlikely to be generated by their difference in the welfare weight a in the government's goal function. For each sufficiently small a, there exists a unique lower bound value for threshold value $\gamma^*(a) \in (0, 1)$ such that the equilibrium FDI is full only if $\gamma \geq \gamma^*(a)$. The following Fig. 4 depicts function $\gamma^*(a)$ over the domain $\gamma^*(a)$ when all the other parameters are set to the benchmark values for China as in Table 1. Function $\gamma^*(a)$ first decreases and then increases

Table 4
Data and calibration results for India.

	$n_{m,k}^*$:n_h	λ_k^*	τ^*
Data	0.06:12	0.410	1.222
Model	0:12	≥0.475	1.235

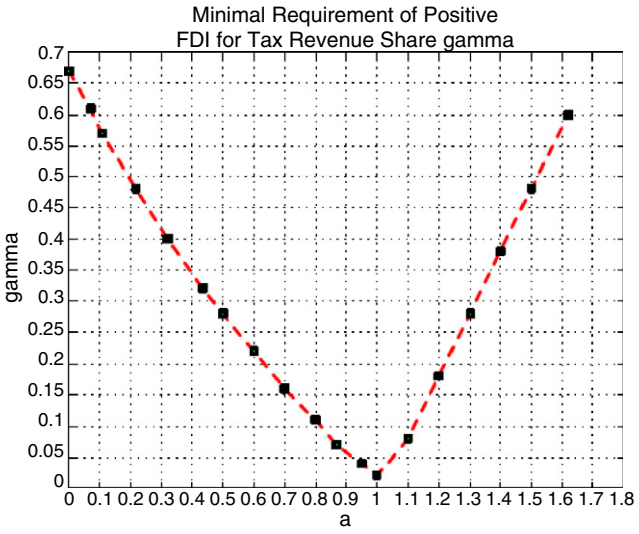

Fig. 4. Increase in welfare weight a might decrease equilibrium FDI.

in a for the following reasons. When a increases from a sufficiently small value, the increase in household welfare becomes more important for the central government relative to the decrease in the profit tax revenue. But the FDI polarization implies that the central government's value is not a continuous function, so when a becomes sufficiently big, the implied tariff rate and profit tax rate become so small that γ^* has to be increased in order to offset the decrease in the tariff revenue and profit tax revenue, as illustrated in Fig. 4.

This non-monotonicity of $\gamma^*(a)$ has an important implication. Suppose China and India are perfectly identical except that China's (a, γ) is (1.302, 0.6) while India's (a, γ) is $(a_{\text{India}}, 0.38)$. Suppose a_{India} exceeds 1.4, larger than China's a, the equilibrium FDI in India would be still zero. In other words, for some given level of fiscal decentralization, an increase in a may shift the economy from a full-FDI equilibrium to a no-FDI equilibrium, although the public welfare function $W(n_m, \tau)$ unambiguously increases with FDI n_m. This is mainly because of the FDI polarization and that the central government also cares about its revenues.

4.2. Cross-country regressions

4.2.1. Data description, measurement, and strategies

The data for fiscal decentralization are from the Government Finance Statistics Yearbook (2008) published by the IMF and cover the period from 2001 to 2008. The FDI data for the same period are from the World Development Indicators (2011) published by the World Bank. We have matched by ourselves a total of 121 countries for FDI and decentralization measures.[35] Fig. 5 plots the logarithm of FDI per capita against fiscal decentralization, which is measured by the subnational government's overall revenue share.

A discernible hump-shaped relationship between FDI and fiscal decentralization is seen in Fig. 5, especially if we ignore the few data points on the far right. A similar inverted-U pattern also exists when fiscal decentralization is measured by using tax revenue share of subnational governments. This non-monotonic pattern is consistent with the theoretical prediction of our model.[36]

[35] The original FDI data cover 234 countries, but only 121 of these countries have fiscal data published by the IMF.

[36] Using a different data set, Kessing et al. (2007) also find an inverted-U-shaped relationship between FDI and fiscal decentralization, where FDI is measured by the total number of cross-border acquisitions (CBAs). Their analysis is based on the SDC platinum database of Thomson Financial, which contains information on CBAs from 64 source countries to 147 host countries. The hump shape is robust for different measures of fiscal decentralization.

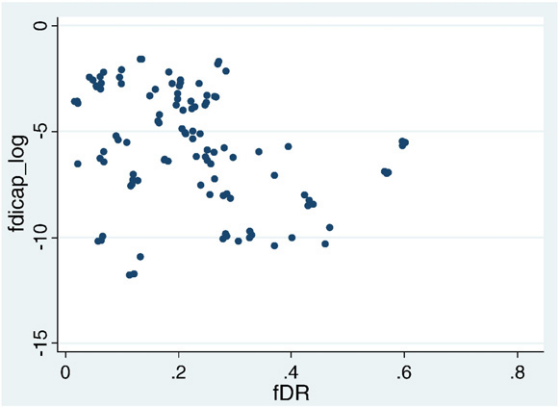

Fig. 5. Inverted-U relationship between FDI and fiscal decentralization measured by revenue share.

More quantitatively, we run the following simple regression:

$$FDI\_PERCAPITA_{i,t} = \beta_0 + \beta_1 Decentralization_{i,t} + \beta_2 \left(Decentralization_{i,t}\right)^2 + \beta_3 X + \beta_4 Year\,Dummy + \varepsilon,$$

where subscripts i and t denote host country and year, respectively. The dependent variable is FDI per capita. The variable *Decentralization* refers to fiscal decentralization, which is measured by the share of the subnational government's overall revenue in total government revenue (fDR). X refers to a vector of relevant economic and institutional controls and ε is the error term. If the coefficient for the quadratic term β_2 is negative at a significant level, then it is interpreted as empirical support for the model's prediction that fiscal decentralization has an inverted-U effect on FDI.

More specifically, X includes three sets of variables. The first set is about the economic conditions including the logarithm of GDP (to control for market size), the logarithm of real GDP per capita (to control for income level and development stage), annual real GDP growth rate (to control for economic dynamism and growth expectations), all of which are from the World Development Indicators (2011). The second set of variables is to control for the institutional features. We include "Polity 2," which is measured by the difference between the democracy index and autocracy index, and captures the extent to which a political regime is responsible to its people. The larger the number, the stronger the democratic checks on the political system. We also include "Executive Constraints", which is composed of indexes that gauge barriers to political entry, the nature of political transitions, and the selection of successors. This value ranges from 1 to 7, with 7 indicating the strongest constraints. Both variables are from the Polity IV data set. We also incorporate the "Corruption Index" from the ICRG (International Country Risk Guide), most commonly used in pertinent economic literature and has the widest coverage of the standard corruption indices. The third set of controls includes the ancillary indicators for general economic development such as infrastructure and urbanization, which comes from the UNSD Statistics database and the World Bank.

Alternatively, we regress the time-average FDI per capita during the period 2001–2008 on fiscal decentralization for different countries together with the same set of controls.

4.2.2. Regression results

In our theoretical model, fiscal decentralization is explicitly defined as the local government's share of revenue, therefore we focus on the revenue-based measures of fiscal decentralization. The main results are reported in Table 5, in which fiscal decentralization is measured by the share of the subnational government's share of overall government revenue (including transfers).

Most importantly, we see that the coefficient for the quadratic term for fiscal decentralization is always negative at the 99% significance level in all regressions, which supports the non-monotonicity result predicted by our theoretical model.

4.2.3. Sensitivity analysis

As emphasized by Bardhan and Mookherjee (2006), fiscal decentralization is defined and measured differently in the literature, so

Table 5
Testing non-monotonic impact of fiscal decentralization on FDI.

Dependent variable:	FDI per capita				Average FDI per capita	
	(1)	(2)	(3)	(4)	(5)	(6)
Fiscal decentralization	3.141***	4.481***	5.718***	8.602***	5.020***	7.298***
	(.824)	(.883)	(1.226)	(2.378)	(.930)	(2.363)
[*Fiscal decentralization*]^2	−2.538***	−3.902***	−5.144***	−8.244***	−4.365***	−7.339***
	(.882)	(.940)	(1.316)	(2.673)	(1.036)	(2.617)
Log (GDP)		−.090***	−.107***	−.081	−.083***	−.071
		(.032)	(.0404)	(.065)	(.031)	(.065)
Log (GDP per capita)		.229***	.330***	.718***	.226***	.226***
		(.045)	(.062)	(.128)	(.043)	(.132)
GDP growth rate		−.001***	−.001***	−.001***	−.001***	−.002**
		(.000)	(.001)	(.001)	(.000)	(.001)
Polity 2			.043	.066		.051
			(.065)	(.101)		(.102)
Executive Constraints			−.213	−.304		−.304
			(.201)	(.318)		(.320)
Corruption Index			−.141	−.113		−.144
			(.101)	(.194)		(.186)
Infrastructure				−.095		−.071
				(.112)		(.104)
Urbanization				−.024***		−.021**
				(.009)		(.009)
Constant	−.099	.535	1.485	.729	.005	−.440
	(.108)	(.949)	(1.388)	(2.541)	(.691)	(2.336)
Year dummy	No	Yes	Yes	Yes	No	No
Observations	203	191	130	71	194	71
R^2	0.0826	0.2368	0.3580	0.5521	0.2371	0.5012

Note: *, **, and *** represent statistical significance at the 10, 5, and 1% level. Standard errors are in parentheses.
Fiscal decentralization is measured by the overall revenue share in columns (1)–(4) and by the tax revenue share in columns (5) and (6).

the results have to be interpreted precisely and carefully. Now, we run the same regressions using two alternative measures for fiscal decentralization. The first alternative is the tax revenue share of total government tax revenue by the subnational government. The results are shown in columns (1)–(3) of Table 6. The results show that the estimate for β_2 continues to be negative at a 99% significance level in all of these regressions, which suggests that the inverted-U effect of fiscal decentralization on FDI is robust to this alternative measure of revenue-based fiscal decentralization.

Another commonly used alternative measure for fiscal decentralization is the expenditure share of the subnational government, but this measure is not relevant for our theoretical purpose. Recall that our analytical focus is on how revenue sharing affects a government's incentive to attract FDI, which in turn determines the endogenous policies toward FDI. Thus, what matters are government revenues from domestic and foreign-invested firms. This is different from the question of how the expenditure structure at different government levels affects FDI inflows via, for example, provision of different public goods. To see this conceptual distinction, imagine that a local government now only cares about its expenditures instead of tax revenues. Suppose its expenditures primarily come from inter-governmental transfers and are independent of its own tax revenues, then the local government would have no incentive to attract FDI by offering generous policies or providing good infrastructure and public services, let alone compete for FDI, even if this local government could gain a large share of expenditures (i.e., more fiscally decentralized). In contrast, if tax revenue can incentivize local governments as in our model, either because tax revenue is an explicit criterion to judge the performance of local government leaders and, hence, affect their promotion (this is particularly true for China) or because tax revenues may affect other personal benefits of local government leaders, then FDI inflows will affect these incentives, regardless of the size of the local government's share of expenditures.

Nevertheless, for curiosity, the results using this expenditure-based measure are also reported in columns (4) to (6) of Table 6. Interestingly, the coefficient for the quadratic term now becomes positive. Several caveats are worth emphasizing. First, the coefficient is insignificant in column (4) and the 95% confidence interval for the estimate of β_2 is [−28.776, 29.828], indicating that the coefficient is not significantly different from zero. Moreover, although the coefficient is significantly positive for both columns (5) and (6), the sample size is much smaller in these two regressions. Second, the coefficients in regressions (5) and (6) imply that $-\frac{\beta_1}{2\beta_2}$ is approximately 5%, which indicates that FDI per capita is essentially increasing (although not linearly) in the share of local government expenditure share in the most relevant range (because the subnational government expenditure share is typically greater than 5% for most countries). This result seems to indicate that the Tiebout effect is empirically more supported by the expenditure-based measure of fiscal decentralization. This empirical finding does not refute the main theoretical mechanism of our model for reasons previously mentioned, but it precisely echoes the warnings by Bardhan and Mookherjee (2006) and suggests that structural theoretical models may be very helpful in identifying the exact economic mechanism and in more precisely interpreting empirical results. We leave deeper explorations of the implications of the expenditure side of fiscal decentralization for future research.

5. Conclusion

This paper develops a theoretical model to show how two developing economies with identical economic fundamentals could have very different policies toward inward FDI (or, better foreign technology) and how these endogenous policies can translate into a tremendous difference in equilibrium FDI inflows. We argue that fiscal decentralization can have a non-monotonic and sometimes significant effect on the policies and FDI. Too much fiscal decentralization may hurt the central government's incentives, so the central government will choose policies that induce local governments to block FDI. On the other hand, too little fiscal decentralization may force local governments to succumb to pressures from protectionist special interest groups. Consequently, policies toward FDI are sufficiently favorable only when fiscal decentralization is within an endogenous medium range. The model also predicts that

Table 6
Tests with alternative measures for fiscal decentralization.

Dependent variable:	FDI per capita					
	(1)	(2)	(3)	(4)	(5)	(6)
Decentralization	3.966***	6.958***	8.591***	−.416	−3.506***	−3.514***
	(.896)	(2.308)	(2.392)	(2.378)	(.653)	(.666)
Decentralization^2	−3.374***	−6..995***	−8.243***	.526	34.251**	34.285***
	(.996)	(2.557)	(2.569)	(14.797)	(14.004)	(14.265)
Log (GDP)		−.070	−.066		.035	−.036
		(.064)	(.062)		(.027)	(.028)
Log (GDP per capita)		.634***	.608***		.052*	.051
		(.129)	(.126)		(.031)	(.031)
GDP growth rate		−.001***	−.001**		−.008	−.008
		(.001)	(.001)		(.009)	(.009)
Polity 2		0.069	.073		.041*	.041
		(.100)	(.097)		(.025)	(.025)
Executive Constraints		−.360	−.354		.039	−.039
		(.312)	(.305)		(.094)	(.096)
Corruption Index		−.138	−.144		−.019	−.018
		(.182)	(.178)		(.036)	(.037)
Infrastructure		−.070	−.121		.010***	.045***
		(.102)	(.102)		(.002)	(.014)
Urbanization		−.020***	−.014		−1.849**	−.010***
		(.009)	(0.009)		(.892)	(.002)
Constant	−.072	−.092	519.048	.230***	.005	16.210
	(.096)	(2.282)	(256.982)	(.088)	(.691)	(.691)
Year dummy	No	No	Yes	No	No	Yes
Observations	203	71	71	121	37	37
R^2	0.106	0.498	0.530	0.017	0.859	0.859

Note: *, **, and *** represent statistical significance at the 10, 5, and 1% level. Std. errors are in parentheses.
Decentralization is measured by tax revenue share in columns (1)–(3) and by expenditure share in columns (4)–(6).

a small change in fiscal decentralization generically does not significantly change equilibrium policies and FDI; however, when crossing an endogenous country-specific cutoff value, a small deviation in fiscal decentralization diametrically shifts the local government's attitude and results in dramatically different policies and amounts of FDI in the equilibrium. The attitudinal polarization of the local government toward FDI is endogenously attributable to the fact that the negative profit-reduction effect is diminishing whereas the tax-base expansion effect is increasing as FDI increases. Therefore, the net benefit of FDI for the local government first decreases and then increases with FDI. This result suggests that the traditional Tiebout effect no longer works when local governments have insufficient incentives to compete for the mobile factors, especially when the net benefit from attracting the mobile factors is not monotonic. Simulations and calibrations using data from China and India support these theoretical findings, which are further substantiated by the cross-country regressions using a much larger country sample.

A direction worth exploring in the future is to extend this one-period model into multiple periods, which will enable an exploration of the dynamics of endogenous policies and the macro economy. Another direction worth exploring is to formalize how the degree of fiscal decentralization is endogenously determined in political and economic institutions. Further promising areas of inquiry also include explicitly introducing firm heterogeneity or other forms of FDI (such as vertical FDI, export-oriented FDI, joint ventures) into the model. Empirically, it is desirable to conduct more sophisticated quantitative investigations, regressions or calibrations, based on a larger sample of countries or different regions within the same country.

Appendix A. Supplementary data

Supplementary data to this article can be found online at http://dx.doi.org/10.1016/j.jdeveco.2013.01.006.

References

Acemoglu, Daron, Robinson, James, 2000. Political losers as a barrier to economic development. American Economic Review 90, 126–130.

Acemoglu, Daron, Helpman, Elhanan, Antras, Pol, 2007. Contracts and technology adoption. American Economic Review 97, 916–943.

Alfaro, L., Chanda, A., Kalemli-Ozcan, S., Sayek, S., 2010. Does foreign direct investment promote growth? Exploring the role of financial markets on linkages. Journal of Development Economics 91, 242–256.

Bardhan, Pranab, Mookherjee, Dilip, 2000. Capture and governance at local and national levels. American Economic Review 90, 135–139.

Bardhan, Pranab, Mookherjee, Dilip, 2006. Decentralization, corruption and government accountability: an overview. In: Rose-Ackerman, Susan (Ed.), International Handbook of the Economic Corruption. Edward Elgar Publishing House.

Becker, Gary, 1983. A theory of competition among pressure groups for political influence. Quarterly Journal of Economics 98, 371–400.

Besley, Timothy, Persson, Torsten, 2009. The origins of state capacity: property rights, taxation, and politics. American Economic Review 99, 1218–1244.

Borensztein, E., De Gregorio, J., Lee, J.-W., 1998. How does FDI affect economic growth? Journal of International Economics 45, 115–135.

Bosworth, Barry, Collins, Susan, 2007. Accounting for growth: comparing China and India. NBER Working Paper 12934.

Branstetter, Lee, Feenstra, Robert, 2002. Trade and foreign direct investment in China: a political economy approach. Journal of International Economics 58, 335–358.

Cai, Hongbin, Treisman, Daniel, 2005. Does competition for capital discipline governments? Decentralization, globalization, and public policy. American Economic Review 95, 817–830.

Cheng, Leonard K., Kwan, Yum K., 2000. What are the determinants of the location of foreign direct investment? The Chinese experience. Journal of International Economics 51, 379–400.

Dixit, Avinash, Grossman, Gene M., Helpman, Elhanan, 1997. Common agency and coordination: general theory and application to government policy making. Journal of Political Economy 105, 752–769.

Doucouliagos, H., Iamsiraroj, S., Ulubasoglu, M.A., 2010. Foreign direct investment and economic growth: a real relationship or wishful thinking? Deakin University Working Paper SWP 2010/14.

Gordon, Roger, Li, Wei, 2009. Tax structures in developing countries: many puzzles and a possible explanation. Journal of Public Economics 93, 855–866.

Grossman, Gene, Helpman, Elhanan, 1994. Protection for sale. American Economic Review 84, 833–850.

Grossman, Gene, Helpman, Elhanan, 1996. Foreign investment with endogenous protection. In: Feenstra, Robert, Grossman, Gene, Irwin, Douglas A. (Eds.), The Political Economy of Trade Policy. MIT Press, Cambridge.

Grossman, Gene, Helpman, Elhanan, 2001. Special Interest Politics. MIT Press, Cambridge.

Helpman, Elhanan, Melitz, Marc, Yeaple, Stephen, 2004. Export versus FDI with heterogeneous firms. American Economic Review 94, 300–316.

Javorcik, Beata Smarzynska, 2004. Does foreign direct investment increase the productivities of domestic firms? In search of spillovers through backward linkages. American Economic Review 93, 605–627.

Jensen, Nathan M., 2005. Fiscal federalism and international capital. Swiss Political Science Review 11 (4), 77–95 (Special Issue from the Economics and Politics Conference in Lugano, Switzerland).

Jensen, Nathan M., 2006. Nation-states and the Multinational Corporation: A Political Economy of Foreign Direct Investment. Princeton University Press.

Kessing, Sebastian G., Konrad, Kai A., Kotsogiannis, Christos, 2007. FDI and the dark side of decentralization. Economic Policy 49, 5–70.

McGrattan, Ellen, Prescott, Edward, 2009. Openness, technological capital, and development. Journal of Economic Theory 144, 2454–2476.

Panagariya, Arvind, 2006. India and China: trade and foreign investment. Presented at the "Pan Asia 2006" Conference, Stanford Center for International Development, June 1–3, 2006.

Parente, Stephen L., Prescott, Edward, 1999. Monopoly rights: a barrier to riches. American Economic Review 89, 1216–1233.

Prasad, Eswar, Wei, Shang-Jin, 2005. The Chinese approach to capital inflows: patterns and possible explanations. NBER Working Paper 11306.

Qian, Yingyi, Roland, Gerard, 1998. Fiscal federalism and soft budget constraint. American Economic Review 88, 1143–1162.

Rodriguez-Clare, Andres, 1996. Multinationals, linkages, and economic development. Journal of International Economics 86, 852–973.

Rodrik, Dani, Subramanian, Arvind, 2005. From 'Hindu growth' to productivity surge: the mystery of Indian growth transition. IMF Staff Papers 52, 193–228.

Singh, Kulwindar, 2005. Foreign direct investment in India: a critical analysis of FDI from 1991–2005. Working Paper. Center for Civil Society, New Delhi.

Srinivasan, T.N., 2006. China, India and the world economy. Working Paper. Yale University.

Wang, Yong, 2009. Essays on political economy, foreign direct investment and economic growth. Ph.D. Dissertation, University of Chicago.

Wei, Shang-jin, 2000. Local corruption and global capital flows. Brookings Papers on Economic Activity 2, 303–354.

Xu, Chenggang, 2011. The institutional foundations of China's reforms and development. Journal of Economic Literature 49, 1076–1151.