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Interregional protection: Implications of fiscal decentralization and trade liberalization

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Abstract

Empirical studies have shown that regional markets in China are highly fragmented. The observation leads to the conclusion of interregional trade protection. In this paper, we develop a model in which a country has two regions and faces import competition to examine how and when interregional trade protection may arise. We find that domestic fiscal decentralization, particularly tax reform, together with high external trade protection, cause interregional protection. This finding, which is generalizable, not only helps explain the rise of interregional protectionism in China but also predicts that external trade liberalization, particularly the country's WTO accession, can help tear down existing interregional trade barriers.

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1. Introduction

It has increasingly been known that regional markets within China are highly fragmented. Market fragmentation prevents production from specialization in accordance with patterns of comparative advantage and from taking advantage of scale economies. For example, China has more than 130 car manufacturing companies scattered all over the country. Most of them do not make profits. Market fragmentation also leads to price dispersion across regions. For example, a bottle of Beijings's Yanjing beer was once sold at equivalent of 18 cents in Beijing but \$1 in Sichuan province (Gilley, 2001). Going

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beyond anecdotal evidence, the careful statistical analysis by Young (2000) shows that in China there is widespread duplication of production between regions and significant divergence in regional prices.¹

In China, lacking a good transportation network is responsible for but not sufficient to explain why the country's regional markets are so fragmented. Interregional protection by local governments also accounts for this outcome. Anecdotal evidence of interregional protection can be easily found. The Shanghai government in the late 1980s mandated that Santana, a local car produced by the Shanghai Volkswagen joint venture, be the only legitimate taxi to run in the city. Gilley (2001) also provides some other examples. Henan and Anhui provinces ban tobacco products from Guizhou province. Agriculture products like grain, flour, and soybeans are still subject to internal trade barriers in most places. In May 2001, Shenzhen city even banned sales of a newspaper from Guangzhou city because it stole readers from the local government run newspapers.² Interregional trade barriers in China are so widespread and severe that they have led the State council to issue many circulars and directives against them (Chen, 1994). In the most recent such directives, issued in April 2001, the central government explicitly outlaws regional blockades.³

Why does interregional protection arise in China? Young (2000) offers one convincing explanation. China's economic reform, which started in 1978, is characterized as an incremental one, as opposed to the "big bang" reform. It frees some segments of the economy from the central government's control and plan but at the same time keeps some under the control and plan. The freed segments find it profitable to exploit the rents in the "unfreed" segments. Local governments then try to capture these rents and protect them. This induced interregional competition and protection leads to "the fragmentation of the domestic market and the distortion of regional production away from patterns of comparative advantage" (Young, 2000, p.1091).

In this paper, we offer an alternative, but not mutually exclusive with Young's (2000), explanation: Internal (or domestic) fiscal decentralization⁴ and external (or

¹ Gilley (2001) also provides evidence on the increasing market fragmentation in China. Interprovincial trade has fallen from the equivalent of 37% of national retail trade in 1985 to about 25% in 2001 while the average distance traveled by freight shipments within China fell to 310 km in 2001 from 395 km in 1978 despite the rapid expansion of national highways, ports, and air-cargo facilities.

² See Young (2000) for some earlier cases.

³ The empirical studies by Bai et al. (in press) and Young (2000) support the hypothesis that local protectionism exists in China. The World Bank (1994) study of China for the period of 1986–1991 and the recent study by Xu (2002) for the period 1991–1998 confirm that markets in China are not completely integrated. Naughton (1999) argues the opposite, however.

⁴ Taxation reform is one of the most important aspects of the fiscal decentralization in China. Yang (2002) has a comprehensive analysis of China's taxation system and reform. Before the economic reform, most tax revenues collected from localities were fully remitted to the central government, which then redistributed them to all provinces and cities according to its economic plan. Since 1979, the country has reformed its taxation system several times, with the most significant ones in 1980, 1984, 1988, and 1994. There are two important features in all those incremental reforms. First, more and more new taxes have been introduced. There are currently 24 major taxes in the country. Second, taxes are divided into three categories: state tax (all revenues from this category go to the central government, e.g., import tariffs), local tax (all revenues from this category go to the local governments, e.g., personal and company income tax), and shared tax (revenues from this category are shared by the central and local governments, e.g., value-added tax). The taxation reform has included more and more taxes to the local-tax category and given local governments a larger share in the shared-tax category.

international) trade protection⁵ together give rise to interregional protection. To demonstrate this proposition, we develop an economic model in which a country, China, consists of two regions and faces import competition. Foreign firms and domestic firms are competing for profits in all local markets. In the paper, we confine internal decentralization to tax reform in which the central government lowers the rate of profit tax that local firms must remit to the state, combined with a reduction of revenue transfer from the central government to each region. Tax reduction increases regional governments' incentives to protect their local firms' profits although protection reduces consumer surplus. When the country's external trade protection is high, the gains from interregional protection will be sufficiently large to warrant local governments' imposition of interregional trade barriers.

To the best of our knowledge, the present study is the first theoretical analysis on the rationale for interregional protection in China. As mentioned earlier, Young (2000) conducts only an empirical study to show market fragmentation in China and offers a plausible explanation, i.e., interregional protection, to the observed phenomenon. The same approach is adopted by Bai, Du, Tao, and Tong (in press). Li and Zhang (in press) take interregional protection as given and examine, theoretically, how China's accession to the WTO affects regional and national welfare in the presence of interregional trade protection or liberalization. Their analysis is based on a model with perfect competition. In contrast, we consider imperfect competition and analyze local governments' incentives to impose interregional trade barriers. Hence, as a by-product, this paper also makes a contribution to the international trade literature on trade liberalization. Studies in this literature have focused on how trade liberalization affects resource allocation, rent seeking activities, foreign direct investments, economic growth, innovation and imitation, merger and acquisitions, etc. Our paper makes a contribution to this line of research by explaining how a country's trade liberalization discourages interregional protection within the country.

Although the idea that domestic decentralization may trigger interregional protection is not completely new, our paper is the first to formalize it. By decentralization, the central government delegates the following three functions to local governments during the reform period: fiscal responsibility and taxation authority, investment and financing authority, and the authority of managing enterprises. After the decentralization, as argued by Yin and Cai (2001), local governments have greater incentives to protect local firms in order to generate more revenues exclusively for their regions.⁶ Our paper differs from Yin and Cai in two major aspects. First, they do not provide a formal analysis to demonstrate the above point. Second, we show that it is the domestic tax reform together with high external trade protection, not the

⁵ It is well known that China had very high trade protection during the 1980s. Several rounds of unilateral trade liberalization have abandoned a lot of nontariff barriers and reduced the average tariff rate to around 12% recently from its high level, over 50%, in the 1980s.

⁶ Ping (1996, p. 393) also speculates that keeping more revenues is a reason for local protection. Bai et al. (in press), in their empirical study on geographic concentration of China's industries, also conjecture that fiscal decentralization gives local governments an incentive to protect local tax base by shielding local industries from interregional competition.

general domestic decentralization alone as they argue, that leads to interregional protection.

Our paper not only provides an explanation to the rise of interregional protection in China during the reform period but also predicts the impacts of China's WTO accession on interregional protection and market fragmentation.⁷ Domestic decentralization, particularly tax reform, is not totally responsible for the rise of interregional protection. High external trade protection also plays a role here. Our analysis predicts that external trade liberalization will eventually tear down interregional trade barriers.

Although the present study is motivated by observations from the Chinese economy, the model and results are far more general. Interregional protection is a universal phenomenon, albeit to different degrees across countries.⁸ Unlike Young (2000) and most other studies on China, our model is not specific to transitional economies. The main features of our model is the explicit consideration of many regions within a country, domestic tax reform, and external trade liberalization. All countries share these features. Hence, this paper provides an interesting hypothesis for empirical test using cross-country data: Low profit tax together with high external trade protection is conducive to interregional protection.

The paper is organized as follows. We set up the basic model in Section 2. We analyze the equilibrium about interregional protection in Section 3. In Section 4, we reexamine the interregional protection issue under the extended model in which firms face entry costs. Section 5 concludes the paper.

2. The model

We construct a minimal model to show the existence of incentives for interregional protection. Consider a country (say, China) which consists of two regions, A and B. There is one industry with one firm in each region, firm A and firm B, possessing the technology to produce the industry's product.⁹ These two domestic firms have different productivities. Specifically, without loss of generality, we assume that firm B has zero marginal cost of production, while firm A has a constant marginal cost $c > 0$. The country is facing import competition. A foreign firm sells its products to markets in both regions with zero marginal cost of production.

⁷ There are many recent studies on the impacts of China's WTO accession on its economy. Li and Zhang (in press) contain some references in this literature. These papers focus on the impacts of WTO accession on China's overall economy and its specific sectors, but none of them examine the impacts on interregional protection, which is the focus of our paper.

⁸ In Canada, the First Ministers on July 18, 1994, signed the Agreement on Internal Trade, aiming to remove international trade barriers in Canada (information from Industry Canada's website). It is observed that in some industries in Canada, it is easier to trade with the United States than it is to trade with the province next door. Brian Kappler (2001) published an opinion article "Petty protections ruin trade: It's easier to trade with the world than with other provinces" in *Edmonton Journal* on August 15, 2001, to argue the severity of interprovincial trade barriers in Canada by giving many examples.

⁹ Our results derived from this minimal model clearly hold in a more general model with more regions, industries, and firms.

Assume that all three firms produce homogenous goods and assume that markets in region A and region B are segmented. For simplicity, we further assume that the two regional markets have the same demand function given by $p(Q)=a-Q$, where a is a constant, which captures the size of each market, and Q is the total quantity consumed or sold in a given market.¹⁰

The central government has two policies. First, it has a fiscal policy, which is defined here as a combination of taxation and revenue transfer. Specifically, the fiscal policy consists of a uniform profit tax (rate), denoted by $t \in (0,1)$, and a lump sum revenue transfer to each region, denoted by T_A and T_B , respectively. Second, it has an international trade policy, tariffs. It is a specific tariff, τ , imposed on each unit of import. We dictate that τ is not too high to prohibit imports. Tariff revenue belongs to the central government.

A local government may impose trade barriers on products shipped into its region from the other region but not on imported products. Hence, we call them *interregional barriers*, or *interregional protection*. Since all these barriers are less visible than tariffs and are not explicitly promulgated by local governments, we assume that they are nontariff barriers. If government A imposes an interregional barrier b_A , then when firm B sells its product to region A's market, it incurs an extra unit cost equal to b_A . Government B's interregional barrier b_B is defined in the same way. However, unlike import tariffs, these barriers do not generate direct revenues to the governments.¹¹

In order to focus on local governments' incentives to protect local firms, we assume that the central government's fiscal policy (t , T_A , and T_B) and trade policy (τ) are fixed and exogenously given in this model. Let $\mathfrak{R}=\{t, T_A, T_B, \tau\}$. We consider a two-stage game between the local governments and all firms. In the first stage, each local government sets its interregional barriers. In the second stage, each firm chooses its output level to compete in the markets. That is, the firms engage in quantity competition, à la Cournot.

3. The rise and fall of interregional protection

Let us first analyze the second stage of the game under any given interregional barriers $\mathfrak{R}=\{b_A, b_B\}$. Firms choose their quantities for each market to maximize their total profits.

There are three firms competing simultaneously in two separate markets, A and B. Since the two markets are segmented and the firms have constant-returns-to-scale technologies, each firm will just choose its output for an individual market to maximize its profit derived from that market.

¹⁰ It will become clear later that allowing the two markets to have different demand functions will not alter the qualitative aspect of our results.

¹¹ In the study of China's tobacco industry, Zhou (2000) points out that when local governments begin to resort to trade restrictions to protect local firms, a most common maneuver is to pressure the local wholesale companies not to order certain brands made in other provinces. This is a perfect example of nontariff barriers and an extreme example of interregional protection.

Let us start with region A's market. Taking others' output as given, each firm in A's market chooses its quantity— q_A for firm A, q_B for firm B, and q_F for the foreign firm—to maximize its pretax profit,¹²

$$\pi_A = (a - q_A - q_B - q_F - c)q_A,$$

$$\pi_B = (a - q_A - q_B - q_F - b_A)q_B,$$

$$\pi_F = (a - q_A - q_B - q_F - \tau)q_F.$$

As a result, the Cournot–Nash equilibrium outputs are

$$q_A^*(b_A, \tau) = (a - 3c + b_A + \tau)/4,$$

$$q_B^*(b_A, \tau) = (a + c - 3b_A + \tau)/4, \quad (1)$$

$$q_F^*(b_A, \tau) = (a + c + b_A - 3\tau)/4.$$

The equilibrium profits are

$$\pi_A^*(b_A, \tau) = (a - 3c + b_A + \tau)^2/16,$$

$$\pi_B^*(b_A, \tau) = (a + c - 3b_A + \tau)^2/16, \quad (2)$$

$$\pi_F^*(b_A, \tau) = (a + c + b_A - 3\tau)^2/16.$$

In order to show how interregional barriers drive nonlocal firms out of a market, we assume that in the absence of interregional barriers, all firms produce positive outputs for each market. Using Eq. (1), this condition translates to the following condition, which we assume to hold through the analysis:

$$\textbf{Condition 1: } c < \frac{a}{5} \text{ and } \tau < \frac{a+c}{3}. \quad (C1)$$

From Eq. (1), we know that firm B enters region A's market if and only if

$$b_A < \bar{b}, \text{ where } \bar{b} \equiv \frac{a+c+\tau}{3}. \quad (3)$$

Hence, we need only to pay attention to $b_A \leq \bar{b}$ because beyond this range a change in b_A will not affect anything.

¹² It is identical to maximizing their after-tax profits.

Now we move back to the first stage of the game. Since regional markets are segmented and the firms have constant-returns-to-scale technologies, government A’s optimal policy does not depend on firm A’s profit derived from region B’s market. Because of this, b_B does not affect government A’s decision on b_A . Hence, government A simply chooses b_A to maximize the region’s welfare derived from its local market. This welfare consists of three parts, firm A’s after-tax profit from market A, consumer surplus, and revenue transfer from the central government,¹³

$$W_A(b_A; \mathfrak{N}) = (1 - t)\pi_A^*(b_A, \tau) + \frac{1}{32}(3a - c - b_A - \tau)^2 + T_A, \quad b_A \in [0, \bar{b}]. \quad (4)$$

Note that $W_A(b_A; \mathfrak{N})$ is a continuous and differentiable function of b_A , and

$$\frac{\partial^2 W_A(b_A; \mathfrak{N})}{\partial b_A^2} = \frac{1 - t}{8} + \frac{1}{16} > 0, \quad \forall b_A \in [0, \bar{b}].$$

That is, $W_A(b_A; \mathfrak{N})$ is a strictly convex function of b_A . Hence, the optimal b_A^* that maximizes $W_A(b_A; \mathfrak{N})$ will be always attained at the end points of the domain of b_A . Substituting Eq. (2) into Eq. (4) yields

$$W_A(b_A = 0) = \frac{1 - t}{16}(a - 3c + \tau)^2 + \frac{1}{32}(3a - c - \tau)^2 + T_A,$$

$$W_A(b_A = \bar{b}) = \frac{1 - t}{16}(a - 3c + \bar{b} + \tau)^2 + \frac{1}{32}(3a - c - \bar{b} - \tau)^2 + T_A.$$

By comparing these two welfare levels, we obtain the optimal interregional barrier imposed by government A, as specified in Proposition 1. Define

$$t_A \equiv \frac{3(7\tau - a - 9c)}{14(a - 2c + \tau)}, \quad \text{and } t_A \in (0, 1) \text{ for } \tau > \frac{1}{7}(a + 9c).$$

Lemma 1. *Given the central government’s policy \mathfrak{N} and under condition (C1), government A’s optimal interregional barrier is*

$$b_A^* = \begin{cases} 0 & \text{for (i) } \tau \leq \frac{1}{7}(a + 9c) \text{ or (ii) } \tau \in (\frac{1}{7}(a + 9c), \frac{1}{3}(a + c)) \text{ and } t \geq t_A, \\ \bar{b} & \text{for } \tau \in (\frac{1}{7}(a + 9c), \frac{1}{3}(a + c)) \text{ and } t < t_A. \end{cases}$$

Proof. $W_A(b_A = \bar{b}) - W_A(b_A = 0) = -f(t)(a + c + \tau)/288$, where $f(t) = 3(a + 9c - 7\tau) + 14(a - 2c + \tau)t$. Note that under condition (C1), $f'(t) = 14(a - 2c + \tau) > 0$ and $f(1) = 17a - 7c - 7\tau > 0$. However,

¹³ Two points are worthy of a discussion. First, this objective function is similar, in form, to the usual ones in which a government places a weight $(1 - t)$ on profits relative to the weight it places on consumer surplus. However, it is wrong to make such an interpretation in this model because $(1 - t)$ changes if and only if the central government changes its fiscal policies. Second, as it is common in the literature, this objective function contains only profits, consumer surplus, and tax transfer but not others such as employment.

$f(0)=3(a+9c-7\tau)$, which is positive for $\tau < (a+9c)/7$ and negative for $(a+9c)/7 < \tau < (a+c)/3$. Moreover, $f(t_A)=0$. Based on this property of $f(t)$, we obtain the optimal b_A^* as specified in the lemma. \square

Let us explain the intuition behind Lemma 1. Imposing an interregional barrier raises the local firm's profit but lowers consumer surplus. It is clear that the latter effect dominates the former one when the profit tax rate is very high ($t \geq t_A$ in this model). Hence, government A should make its interregional protection as low as possible. This also implies that the only case for imposing a high interregional barrier is when the profit tax rate is sufficiently low. However, even if the profit tax rate is low, interregional barriers are not very effective in helping the local firm to increase its profit if the firm is facing intensive market competition anyway, which is the case when τ is sufficiently low ($\tau \leq (a+9c)/7$ in this model). Thus, it is optimal for government A to impose a high interregional barrier when and only when the profit tax is low and import tariff is high.

Note that government A's optimal policy is either no protection or prohibitive barriers. This extreme policy stems from the fact that the government's objective function is convex in the choice variable b_A . The convexity comes from our assumption that b_A is a nontariff barrier. If b_A is a tariff-type interregional barrier, the government's objective function should include a tariff revenue term, which will make the function concave. However, we focus on the nontariff barrier case because we believe it captures the real interregional protection better than tariff. Usually, regional governments will not dare to impose interregional protection openly and systematically, as opposed to a country imposing tariffs on imports of the foreign goods. Hence, it is very difficult for a region's government to collect tariff revenue from the other region's firms selling products to this region, and consequently nontariff barriers are used.

Let us now turn to region B's market to derive the optimal interregional barrier imposed by government B. Given b_B , the three firms choose their respective outputs for this market, q_A , q_B , and q_F , to maximize their respective pretax profits:

$$\pi_A = (a - q_A - q_B - q_F - b_B - c)q_A,$$

$$\pi_B = (a - q_A - q_B - q_F)q_B,$$

$$\pi_F = (a - q_A - q_B - q_F - \tau)q_F.$$

As a result, the Cournot–Nash equilibrium outputs are

$$q_A^x(b_B, \tau) = (a - 3c - 3b_B + \tau)/4,$$

$$q_B^x(b_B, \tau) = (a + c + b_B + \tau)/4, \tag{5}$$

$$q_F^x(b_B, \tau) = (a + c + b_B - 3\tau)/4.$$

The equilibrium profits are

$$\begin{aligned} \pi_A^x(b_B, \tau) &= (a - 3c - 3b_B + \tau)^2/16, \\ \pi_B^x(b_B, \tau) &= (a + c + b_B + \tau)^2/16, \\ \pi_F^x(b_B, \tau) &= (a + c + b_B - 3\tau)^2/16. \end{aligned} \tag{6}$$

From Eq. (5), we know that firm A enters region B’s market if and only if

$$b_B < \tilde{b}, \text{ where } \tilde{b} \equiv \frac{a - 3c + \tau}{3}. \tag{7}$$

Hence, we can restrict our attention to $b_B \leq \tilde{b}$ because beyond this range a change in b_B will not affect anything.

Moving back to the first stage of the game, we examine how government B will choose b_B to maximize the region’s welfare derived from the local market:

$$W_B(b_B; \mathfrak{N}) = (1 - t)\pi_B^x(b_B, \tau) + \frac{1}{32}(3a - c - b_B - \tau)^2 + T_B, \quad b_B \in [0, \tilde{b}] \tag{8}$$

Define

$$t_B \equiv \frac{3(7\tau - a + 3c)}{2(7a + 3c + 7\tau)}, \text{ and } t_B \in (0, 1) \text{ for } \tau > \frac{1}{7}(a - 3c).$$

We then have a result similar to Lemma 1.

Lemma 2. *Given the central government’s policy \mathfrak{N} and under condition (C1), local government B’s optimal interregional barrier is*

$$b_B^* = \begin{cases} 0 & \text{for (i) } \tau \leq \frac{1}{7}(a - 3c) \text{ or (ii) } \tau \in (\frac{1}{7}(a - 3c), \frac{1}{3}(a + c)) \text{ and } t \geq t_B, \\ \tilde{b} & \text{for } \tau \in (\frac{1}{7}(a - 3c), \frac{1}{3}(a + c)) \text{ and } t < t_B, \end{cases}$$

Proof. It is easy to show that $W_B(b_B)$ is a strictly convex function and $W_B(b_B = \tilde{b}) - W_B(b_B = 0) = g(t)\tilde{b}/32$, where $g(t) \equiv (-2a + 6c + 6\tau + 3\tilde{b}) - 2(2a + 2c + 2\tau + \tilde{b})t$. Note that under condition (C1), $g'(t) = -2(2a + 2c + 2\tau + \tilde{b}) < 0$ and $g(1) = -(19a - 9c - 5\tau)/3 < 0$. However, $g(0) = (-a + 3c - 7\tau)$, which is negative for $\tau < (a - 3c)/7$ and positive for $(a - 3c)/7 < \tau < (a + c)/3$. Moreover, $g(t_1) = 0$. This property of $g(t)$ yields the optimal b_B^* as specified in the lemma. □

The intuition behind Lemma 2 is the same as that behind Lemma 1.

Summarizing Lemmas 1 and 2, we immediately establish the major result of this study.

Proposition 1. *Given the central government's policy \aleph and under condition (C1), local governments impose no interregional barriers if (i) tariff rate is low, or (ii) both corporate profit tax and import tariff rates are high. They impose interregional barriers if corporate tax rate is low but tariff rate is high.*

Let us divide the central government's policy \aleph into four regimes (see Fig. 1). In the *centralization-cum-protection* regime (C–P regime, in short), the central government sets a large t and a large τ , together with a sufficiently large T_i ($i=A, B$) to support each locality. In the *decentralization-cum-protection* regime (D–P regime, in short), the central government sets a small t and a large τ , together with a small or zero T_i . In the *centralization-cum-liberalization* regime (C–L regime, in short), the central government keeps t at high levels but τ at low levels, coupled with a large T_i . In the *decentralization-cum-liberalization* regime (D–L regime, in short), both t and τ are small, together with a small or zero T_i .

Proposition 1 offers a nice explanation to the rise and (eventual) fall of interregional protection in China. When the transitional country moves from a C–P regime to a D–P regime, interregional protection arises, from $b_B^*=0$ to $b_A^*=\bar{b}$ in region A and from $b_B^*=0$ to $b_B^*=\bar{b}$ in region B; when it moves from a D–P regime to a D–L regime, interregional protection disappears, from $b_A^*=\bar{b}$ to $b_A^*=0$ in region A and from $b_B^*=\bar{b}$ to $b_B^*=0$ in region B. This sequence of regime evolution captures the two-decade-long reform process in China. At the beginning of its economic reform in 1979, China was a highly centralized and extremely closed economy (the C–P regime). Tax revenues collected from localities were fully remitted to the central government in Beijing. The country had limited international trade. Average tariff rate was above 50%. Moreover, the country's foreign trade was planned by the government and totally monopolized by state-owned foreign trade corporations. In the entire 1980s and early 1990s, the government had reformed its taxation system several times but the pace of trade liberalization was very slow (the D–P regime). The general direction of taxation reform was to reduce corporate profit tax rate and allow provincial governments to keep a large share of tax revenues. Tax reform had been by and large completed by 1994. Since 1996, China had speeded up its trade liberalization (the D–L regime). To bid for WTO entry, China had unilaterally lowered its tariffs several times. Its average tariff rate has dropped from 42.9% in 1992 to 26.6% in 1996, 17.5% in 1999, 16.6% in 2001, and 12% by the end of 2002. The country's international trade is no longer monopolized by state-owned foreign trade corporations. China successfully entered the WTO by the end of 2001, signifying that its foreign trade system has become fully compatible with the international standard.¹⁴

¹⁴ It is beyond the scope of the present study to analyze the optimal sequence of a transitional economy's internal reforms and external trade liberalization. Although Proposition 1 and the above discussion together imply that interregional protection would not have arisen should the central government carry out trade liberalization before or simultaneously with fiscal decentralization, our model is not comprehensive enough to allow us to conclude that the actual sequence is not optimal. In the central government's decentralization–liberalization plans, there are a lot of other concerns, which are not considered in our model.

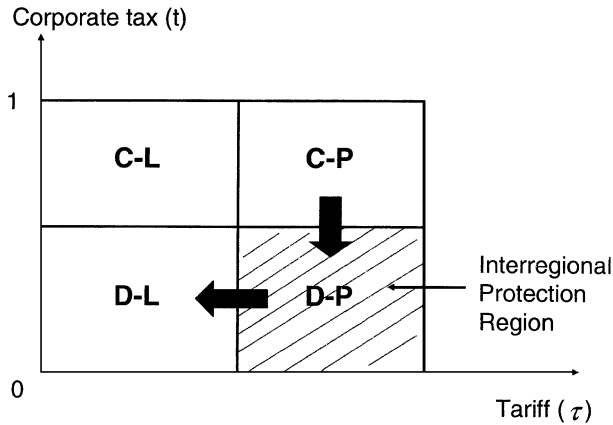


Fig. 1. Sequence of decentralization and liberalization and the rise and fall of interregional protection.

3.1. Comparison

By comparison between the two regions (Lemmas 1 and 2), we obtain some interesting observations. First, suppose that tariff is sufficiently high that interregional barriers are possible to arise in both regions, which is the case if $\tau > 1/7(a+9c)$. Then, before a tax reform (i.e., t is large) no local government imposes an interregional barrier. As tax reform starts and goes deeper (i.e., t starts and continues to drop), we will first see $t \in (t_A, t_B)$ because $t_A < t_B$. That is government B erects an interregional barrier earlier than government A. This seems counterintuitive because it says that the more competitive region B introduces interregional barriers first. But it can be easily explained. Region B receives more profit than region A and hence when the local firms can keep a larger proportion of their profits, government B will have a stronger incentive than government A to firstly enlarge its firm's pretax profit by erecting an interregional barriers.¹⁵

Second, suppose that the tax rate is sufficiently low that both local governments may impose interregional barriers, which is the case when $t < t_B$. Then, before trade liberalization takes place in the country [i.e., when $\tau > (a+9c)/7$], there are interregional barriers in both regions. As trade liberation starts and goes deeper, we will first encounter the case in which $\tau \in ((a-3c)/7, (a+9c)/7)$. Government A will remove its interregional barriers earlier than government B. As trade liberation reduces local firms' profits and raises consumer surplus, it makes interregional protection less attractive. Government A gives up protection first because the region enjoys less profit than region B.

Third, although government B erects interregional barriers under more circumstances than government A, whenever both governments impose interregional barriers, government A's barrier is higher than government B's, $\bar{b} > \tilde{b}$. This is simply because government A

¹⁵ Bai et al. (in press) provide an indirect empirical support to this comparison. They find that local governments have a stronger incentive to protect those industries that enjoyed more profits in the past. In the case of the present paper, firm B enjoys a larger profit than firm A when they face the same policy environment.

needs a higher barrier than government B does in order to prohibit the nonlocal rivalry from entering the local market.¹⁶

4. Entry costs and strategic interregional protection

The preceding section has shown that in the decentralization–protection regime, local governments erect interregional protection to protect profits of their existing industries. Such protection hampers market competition but it does not affect the country's industry structure (i.e., the number of total firms in the country does not change). In this section, we explore a more severe case in which interregional protection is used to deter potential firms' entry to the industry. To this end, we modify our model by assuming that the two domestic firms have identical (zero) marginal costs of production, i.e., $c = 0$, but face different costs of entering the industries. To highlight the difference between the two regions, without loss of generality, we assume that firm B faces zero industry-entry cost, and firm A faces an industry-entry cost $k > 0$.¹⁷ Other specifications remain the same as in Section 3.

We shall divide our analysis into two parts, low-tariff case and high-tariff case.

4.1. Low tariffs

Let us first consider the simplest case in which $\tau = 0$. For obvious reasons, we should focus on the case where entry cost k is neither too high to always keep firm A from entering the industry nor too low that no policy can discourage firm A from entering the industry. In particular, we assume that firm A will enter the industry when there is no interregional protection in either of the markets but will not enter the industry if government B imposes a prohibitive barrier (\tilde{b}) in the market B and government A does not protect firm A in market A. From the analysis in Section 3, this condition is equivalent to

$$\text{Condition 2 : } \frac{a^2}{16} < k < \frac{a^2}{8}. \quad (\text{C2})$$

Suppose $b_B = 0$, then from Lemma 1 it is clear that government A's optimal response is to set $b_A = 0$.

¹⁶ In the multiple industries case, the implication of Proposition 1 are as follows. As domestic tax reform proceeds, a local government will impose interregional trade barriers on its competitive advantageous sectors earlier than on its competitive disadvantageous sectors. As the country's trade liberalization starts, a local government will remove interregional trade barriers from its competitive disadvantageous sectors earlier than from its competitive advantageous sectors. When a local government has interregional barriers on all sectors, those for the less competitive sectors are higher than those for the more competitive sectors.

¹⁷ The basic result as stated in Proposition 2 at the end of the section will not be altered if we assume that both regions have similar entry costs. However, the equilibrium analysis becomes very complicated. Hence, we focus on the asymmetry case in order to bring out the message as clearly as possible.

Suppose $b_A=0$, we derive government B’s optimal response below. There are two possible outcomes from the imposition of b_B : Firm A enters the industry or it does not. By condition (C2), firm A enters if $b_B=0$ but it does not enter $b_B=\tilde{b}$. Note that for a given k satisfying condition (C2), a b_B lower than \tilde{b} can be sufficient to deter firm A’s entry to the industry. However, on the one hand, as long as firm A is deterred from entering, region B’s welfare is equal to that at $b_B=\tilde{b}$. On the other hand, as long as firm A is not deterred from entering B’s market, government B should set $b_B=0$ as indicated by Lemma 2. Hence, we need to only compare region B’s welfare at $b_B=0$ and $b_B=\tilde{b}$. Region B’s welfare is the sum of the after-tax profits from two markets (A and B), consumer surplus, and the central government’s revenue transfer, which can be easily obtained as

$$\hat{W}_B(0) = (1 - t) \frac{a^2}{8} + \frac{9a^2}{32} + T_B, \text{ and } \hat{W}_B(\tilde{b}) = (1 - t) \frac{2a^2}{9} + \frac{2a^2}{9} + T_B.$$

Direct comparison yields

$$\hat{W}_B(0) - \hat{W}_B(\tilde{b}) \begin{cases} > 0 & \text{for } t > 11/28, \\ = 0 & \text{for } t = 11/28, \\ < 0 & \text{for } t < 11/28. \end{cases}$$

The above result can be easily understood. With a high interregional barrier, region B’s loss in consumer surplus outweighs its gain in product profit derived from the local market. However, there is an additional profit gain in region A’s market because firm A’s entry is deterred. When profit tax is sufficiently low, the after-tax profit gain outweighs the loss in consumer surplus. In that case, prohibitive interregional barrier is optimal.

If government B sets \tilde{b} , what is government A’s optimal response? Government A’s decision is whether to choose $b_A=0$ or to choose a sufficiently large b_A to induce firm A’s entry to the industry. First, note that a necessary and sufficient condition to induce firm A’s entry (when $b_B=\tilde{b}$) is that firm A’s pretax profit is nonnegative, i.e., $(a+b_A)^2/16-k \geq 0$, or $b_A \geq b^e \equiv 4\sqrt{k} - a$. However, region A’s maximum barrier is $\bar{b}=a/3$. Hence, under condition (C2), the above analysis shows that firm A is induced to enter the industry (only market A) if and only if $k \in (a^2/16, a^2/9)$ and $b_A \geq b^e$. As a result, for $k \in [a^2/9, a^2/8)$, government A is not able to induce firm A to enter the industry.

Second, suppose $k \in [a^2/16, a^2/9)$. Then, region A’s welfare at $b_A \geq b^e$ is

$$\hat{W}_A(b_A) = (1 - t) \left[\frac{(a + b_A)^2}{16} - k \right] + \frac{1}{32} (3a - b_A)^2 + T_A.$$

Since $\hat{W}'_A(b_A) = -[(1+2t)a - (3-2t)b_A]/16 < 0$ for all $b_A \leq \bar{b}$, as long as government A wants to induce firm A’s entry, it is optimal to set $b_A \geq b^e$. Hence, we only need to compare

$$\hat{W}_A(b_A = 0) = \frac{2a^2}{9} + T_A \text{ and } \hat{W}_A(b_A = b^e) = \frac{1}{2} (a - \sqrt{k})^2 + T_A.$$

We find that $\hat{W}_A(0) < \hat{W}_A(b^e)$ because $k < a^2/9$. That is, whenever government A can choose a high interregional barrier to induce firm A’s entry to the industry, it always does so.

Third, if government A sets $b_A=b^e$, it is optimal for government B to set $b_B=0$, as indicated by Lemma 2, since it cannot deter firm A's entry anyway.

Finally, if $b_B=0$, it is optimal for government A to set $b_A=0$, which however will induce government B to set $b_B=\tilde{b}$. Hence, there is no pure strategy Nash equilibrium for $k \in [a^2/16, a^2/9)$ and $t < 11/28$.

We can now summarize the result of above analysis in Lemma 3.

Lemma 3. *Suppose condition (C2) holds and $\tau=0$.*

- (i) *The equilibrium interregional barriers are $\{b_A^{**}=0, b_B^{**}=0\}$ if $t \geq 11/28$.*
- (ii) *The equilibrium interregional barriers are $\{b_A^{**}=0, b_B^{**}=\tilde{b}\}$ if $t < 11/28$ and $k \in [a^2/9, a^2/8)$.*
- (iii) *There exists no pure strategy Nash equilibrium interregional barriers if $t < 11/28$ and $k \in [a^2/16, a^2/8)$.*

We impose condition (C2) because if such a condition does not hold, the equilibrium is obvious and less interesting. If $k \leq a^2/16$, the entry cost is so low that firm A always enter the industry, with and without the government A's protection. Then, we are back to the no-entry-cost case as in Section 3. Since $\tau=0$, Lemmas 1 and 2 say that the equilibrium is no interregional protection. If $k > a^2/8$, the entry cost is so high that firm A cannot enter the industry anyway. Then, government A's optimal choice is $b_A^{**}=0$ and government B also sets $b_B^{**}=0$ since it does not have to rely on interregional protection to deter firm A's entry to the industry.

Compared to Lemmas 1 and 2, Lemma 3 shows the increase of interregional protection in the presence of entry cost. In the absence of entry cost (i.e., $k \in [a^2/9, a^2/8)$) and low profit tax rate (i.e., $t < 11/28$), government B imposes the prohibitive interregional barrier. Government B strategically protects its local market in order to help its firm get a higher profit in the other region's market.¹⁸

According to Lemma 3 (iii), there exist no pure strategy Nash equilibrium if $t < 11/28$ and $k \in [a^2/16, a^2/9)$. We can prove that there exists a unique mixed strategy Nash equilibrium. That is, there exists a unique $\theta_A \in (0,1)$ and $\theta_B \in (0,1)$ such that government A sets $b_A=0$ with probability θ_A and $b_A=b^e$ with probability $1-\theta_A$, and government B sets $b_B=0$ with probability θ_B and \tilde{b} with probability $1-\theta_B$. In this case, the "average" degree of interregional protection is higher than in the case where there is no entry cost.

Corollary. *Suppose condition (C2) holds and $\tau=0$. There exists a unique mixed strategy Nash equilibrium interregional barriers if $t < 11/28$ and $k \in [a^2/16, a^2/9)$.*

Proof. See Appendix A1. □

4.2. High tariffs

So far, we have shown that in the case of $\tau=0$, government B uses interregional barrier as a strategic device to deter firm A's entry to the industry. There will be no interregional

¹⁸ The result is similar to the idea of import protection as export promotion, but without increasing returns to scale.

protection in either region in the absence of such strategic behavior. Now we show that the same result holds in a more general situation, i.e., $\tau \neq 0$. To address this point as clearly as possible, we focus on the case in which interregional protection will not arise otherwise. That is, according to Lemmas 1 and 2, we should confine our analysis to (i) $\tau \leq a/7$ and (ii) $\tau \in [a/7, a/3]$ with $t \geq \bar{t}$, where

$$\bar{t} \equiv \frac{3(7\tau - a)}{14(a + \tau)}.$$

For obvious reasons, we should focus on the case where entry cost k is neither too high to always keep firm A from entering the industry nor too low that no policy can discourage firm A from entering the industry. In particular, we assume that firm A will enter the industry when there is no interregional protection in either of the markets but will not enter the industry if government B imposes a prohibitive barrier (\tilde{b}) in market B and government A does not protect firm A in market A. From the analysis in Section 3, this condition is equivalent to

Condition 3:
$$\frac{(a + \tau)^2}{16} < k < \frac{(a + \tau)^2}{8}. \tag{C3}$$

Denote $t_0 \equiv (11a + 35\tau) / 28(a + \tau)$. For the case $\tau \leq 1/7a$, we obtain the following lemma:

Lemma 4. *Suppose condition (C3) holds and $\tau \in (0, a/7)$.*

- (i) *Then the equilibrium interregional barriers are $\{b_A^{**} = 0, b_B^{**} = 0\}$ if $t \geq t_0$.*
- (ii) *The equilibrium interregional barriers are $\{b_A^{**} = 0, b_B^{**} = \tilde{b}\}$ if $t < t_0$ and (a) $k \in [(a - 2\tau)^2 / 9(a + \tau)^2 / 8, (a + \tau)^2 / 16]$, or (b) $k \in [(a + \tau)^2 / 16, (a + 2\tau)^2 / 9]$, and $\tau \in [a/11, a/7]$.*
- (iii) *There exists no pure strategy Nash equilibrium interregional barriers if $t < t_0$, $k \in [(a + \tau)^2 / 16, (a + 2\tau)^2 / 9]$ and $\tau \leq a/11$.*

Proof. See Appendix A2. □

For the case $\tau \in [a/7, a/3]$ and $t \geq \bar{t}$, we obtain Lemma 5. The proof is similar to that of Lemma 4 and therefore not shown.

Lemma 5. *Suppose condition (C3) holds, $\tau \in [a/7, a/3]$ and $t \geq \bar{t}$.*

- (i) *Then the equilibrium interregional barriers are $\{b_A^{**} = 0, b_B^{**} = 0\}$ if $t \geq t_0$.*
- (ii) *Then the equilibrium interregional barriers are $\{b_A^{**} = 0, b_B^{**} = \tilde{b}\}$ if $t < t_0$.*

The general message from Lemmas 4 and 5 is that government B will use interregional trade protection to deter firm A’s entry to the industry when t is not too large and k is moderate.

In the above analysis, we have omitted the case where $\tau \in [a/7, a/3]$ and $t < \bar{t}$. In fact, in the case, both governments impose interregional trade barriers, with and without entry costs (Lemmas 1 and 2). This case is less interesting because we cannot highlight the

strategic role of interregional trade barriers. Nonetheless, we mention the equilibrium in this case here for completeness.

The above analysis allows us to establish the main conclusion of this section in Proposition 2.

Proposition 2. *Given the central government's policy τ . When corporate tax is not too large and entry cost is moderate, a local government (B in this model) has incentive to impose interregional barriers to strategically deter potential firms in the other region from entering the industry. As a result, interregional protection is higher with entry costs than without entry costs.*

Two central messages are contained in the above proposition, compared to Proposition 1, which is obtained under the assumption of no entry costs. First, there is no strategic reason for interregional protection in the absence of entry cost. When firm A has to pay a moderate fixed cost to enter the industry, government B erects a high barrier in its local market in order to get a larger profit in the other region's market. Second, we will see more interregional protection when firms face entry costs.

5. Conclusion

China's domestic markets are fragmented partly due to interregional trade protection. In this paper, we argue that interregional protection may arise because of domestic fiscal decentralization and international trading protection. We also predict that China's accession to the WTO will reduce local governments' incentive to maintain interregional trade barriers.

Our findings and predictions lead to an empirically testable hypothesis: Other things being equal, countries with low profit tax but high international trade protection tend to have more interregional trade protection.

Instead of erecting interregional trade barriers, local governments can also assist local firms through other protectionist devices such as production or entry subsidies. Like interregional trade barriers, subsidies will also distort protection structure away from patterns of comparative advantage. However, the analysis of optimal subsidies could be very different from nontariff barriers because nontariff barriers do not generate tariff revenue to local welfare and subsidies require government budget. We leave the comparison of various form of interregional protection for future research.

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Appendix A

A.1. Proof of Corollary

By Nash Theorem (1950), we know that in a finite static game of complete information, there exists at least one Nash equilibrium, possibly involving mixed strategy Nash equilibrium. Since there does not exist any pure strategy Nash equilibrium when $t \geq 11/28$ and $k \in [(1/16)a^2, (1/9)a^2]$, there must exist at least one mixed strategy Nash equilibrium. Now it is left to show that there exists at most one mixed strategy Nash equilibrium. We can use the method of reaction function to show this point.

Note that government A has two pure strategies ($b_A=0, b_A=b^e$) and government B has two pure strategies ($b_B=0, b_B=\tilde{b}$). Let π_{ij}^m denote the welfare of region m ($=A,B$) when government A chooses strategy i ($=1,2$) and government B chooses strategy j ($=1,2$). Let $\theta_m \in (0,1)$ be the probability of government m setting $b_m=0$.

Since there does not exist any pure strategy Nash equilibrium, government m will be indifferent between strategy 1 and strategy 2 given the other government's mixed strategy. First, government A's optimal response to government B's choice θ_B is $\theta_A \in (0,1)$. Moreover, θ_B must satisfy $\theta_B \pi_{11}^A + (1-\theta_B) \pi_{12}^A = \theta_B \pi_{21}^A + (1-\theta_B) \pi_{22}^A$, from which we get

$$\theta_B = \frac{\pi_{22}^A - \pi_{12}^A}{\pi_{11}^A + \pi_{22}^A - \pi_{12}^A - \pi_{21}^A}.$$

It can be verified that $\theta_B \in (0,1)$. Similarly, we can get government B's reaction to government A's choice of θ_A .

It is clear that the two reaction curves θ_A and θ_B cross vertically and so there exists one and only one intersection. □

A.2. Proof of Lemma 4

(i) Suppose $b_B=0$, then from Lemma 1, government A's optimal response is to set $b_A=0$.

(ii) Suppose $b_A=0$, we derive government B's optimal response below. There are two possible outcomes from the imposition of b_B : Firm A enters the industry or it does not. By condition (C3), firm A enters if $b_B=0$ but it does not enter $b_B=\tilde{b}$. Note that for a given k satisfying condition (C3), a b_B lower than \tilde{b} can be sufficient to deter firm A's entry to the industry. However, on the one hand, as long as firm A is deterred from entering, region B's welfare is equal to that at $b_B=\tilde{b}$. On the other hand, as long as firm A is not deterred from entering B's market, government B should set $b_B=0$ as indicated by Lemma 2. Hence, we need to only compare region B's welfare at $b_B=0$ with its welfare at $b_B=\tilde{b}$. We have (to save notations, we use the same notations as in the proof for Lemma 3)

$$\hat{W}_B(0) = (1-t) \frac{(a+\tau)^2}{8} + \frac{(3a-\tau)^2}{32} + T_B,$$

$$\hat{W}_B(\tilde{b}) = (1-t) \frac{2(a+\tau)^2}{9} + \frac{(2a-\tau)^2}{18} + T_B.$$

Direct comparison yields

$$\hat{W}_B(0) - \hat{W}_B(\tilde{b}) \begin{cases} \geq 0 & \text{for } t \geq t_0, \\ < 0 & \text{for } t < t_0. \end{cases}$$

(iii) Suppose $b_B = \tilde{b}$. First, note that a necessary and sufficient condition to induce firm A's entry (when $b_B = \tilde{b}$) is $b_A \geq b^e \equiv 4\sqrt{k} - a - \tau$. However, region A's maximum barrier is $\tilde{b} = (a + \tau)/3$. Hence, under condition (C3), the above analysis shows that firm A is induced to enter the industry (only market A) if and only if $k \in (a^2/16, a^2/9)$ and $b_A \geq b^e$. As a result, for $k \in [(a + \tau)^2/9, (a + \tau)^2/8]$, government A is not able to induce firm A to enter the industry. In this case, $b_A = 0$.

Now, suppose $k \in [(a + \tau)^2/16, (a + \tau)^2/9)$. Then, region A's welfare at $b_A \geq b^e$ is

$$\hat{W}_A(b_A) = (1 - t) \left[\frac{(a + b_A + \tau)^2}{16} - k \right] + \frac{1}{32} (3a - b_A - \tau)^2 + T_A. \tag{A1}$$

From Eq. A1, we have

$$\hat{W}_A(b^e) - \hat{W}_A(\tilde{b}) = \frac{1}{6} (a + \tau - 3\sqrt{k})(a - \tau - 3\sqrt{k}) + t \left[\frac{1}{9} (a + \tau)^2 - k \right],$$

which is positive if and only if $t \geq t^*$, where

$$t^* \equiv - \frac{(a + \tau - 3\sqrt{k})(a - \tau - 3\sqrt{k})}{9 \left[\frac{1}{9} (a + \tau)^2 - k \right]}.$$

If $\sqrt{k} \in [(a + \tau)/4, (a + \tau)/3]$, we have $t^* < 0$. Hence, $\hat{W}_A(b^e) > \hat{W}_A(\tilde{b})$. Then, we need to compare region A's welfare between $b_A = 0$ and $b_A = b^e$. From Eq. A1, we have $\hat{W}_A(0) > \hat{W}_A(b^e)$ if $\sqrt{k} > (1 - 2\tau)/3$. This allows us to get the following result: For $\sqrt{k} \in ((a + \tau)/4, (a - \tau)/3]$, the optimal b_A is

$$b_A = \begin{cases} 0 & \text{for } \tau \in (\frac{1}{11}a, \frac{1}{7}a) \text{ or } \tau \leq \frac{1}{11}a \text{ and } \sqrt{k} \in (\frac{1}{3}(a - 2\tau), \frac{1}{3}(a - \tau)] \\ b^e & \text{for } \tau \leq \frac{1}{11}a \text{ and } \sqrt{k} \in (\frac{1}{4}(a + \tau), \frac{1}{3}(a - 2\tau)]. \end{cases}$$

Next, if $\sqrt{k} \in [(a - \tau)/3, (1 + \tau)/3]$, we have $t^* > 1$. Hence, $\hat{W}_A(b^e) > \hat{W}_A(\tilde{b})$. Then we need to compare region A's welfare between $b_A = 0$ and $b_A = \tilde{b}$. From Eq. A1, we have $\hat{W}_A(0) > \hat{W}_A(\tilde{b})$ if $t < [k - (a^2 + \tau^2 - 4a\tau)/9] / [(a + \tau)^2/9 - k]$, which holds because $t < t^*$ and t^* is less than the RHS of the inequality. Hence, it's always optimal for region A to set $b_A = 0$.

(iv) Suppose $b_A = b^e$. Then, it is optimal for government B to choose $b_B = 0$ according to Lemma 2 since it is impossible to deter firm A's entry to the industry anyway.

The above four parts prove the lemma. □

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