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Economic opening and domestic market integration

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Does economic opening lead to international as well as domestic market integration? The objective of this chapter is to examine whether China's policy of opening promotes domestic economic integration. Do the growing external links work against the local protectionism and market segmentation? Particularly since the beginning of the Chinese economic reformation, regional protectionism and segmentation have blocked a unified national market, brought about inefficiency in inter-regional resource allocation, distorted the market mechanism and disturbed the price signal. Ultimately, they weaken macroeconomic policies. Therefore, it is necessary to understand the causes of domestic market segmentation and to find the ways of dealing with them.

This chapter examines the determinants of segmentation of the Chinese inter-regional goods market on the basis of provincial panel data, focusing on the impact of economic opening—a fundamental component of Chinese economic reform, driving privatisation and deregulation. The correlation between international and domestic integration is explored, and the analysis predicts a continuing trend of domestic market integration in China.

There has been academic contention over whether there has been a tendency towards inter-provincial integration or segmentation in post-reform China. The process through which it happens still requires theoretical and empirical analysis. Empirical research in this field is recent (Poncet 2005; Bai et al. 2004). There can be further development in measuring market segmentation, the selection and definition of independent variables, and increased sophistication in regression analysis. This chapter makes three

contributions. First, in order to measure China's inter-provincial segmentation, we use Chinese provincial retail price index (RPI) data instead of industrial concentration or trade flow data. Second, we focus on the effect of economic opening on market segmentation. In addition, our approach captures the effects of employment pressure, government consumption, inter-regional technology differentials and geography. Third, the methodology improves on previous papers by attempting to eliminate endogenous bias, including simultaneity bias and omitted-variables bias.

Literature review

What has influenced Chinese domestic market integration? Bai et al. (2004) and Poncet (2005) reached some pertinent conclusions in their empirical research.

Bai et al. (2004) estimated the overall level of geographic concentration of China's industries and factors influencing changes. He used the Hoover coefficient as the dependent variable, and examined the impacts of local protectionism, scale of economy and externalities on industrial concentration. The data supported the hypothesis that industries with a higher tax-plus-profit ratio in the past and those with a higher share of state-owned enterprises tended to have a higher degree of local protectionism, and therefore a lower level of industrial concentration. There is significant negative correlation between the output share of state-owned enterprises and local industrial concentration (Hoover coefficient), so he concluded that local protectionism could lead to market segmentation.

Poncet (2004) applied a gravity model (Head and Mayer 2000) for estimation of the domestic border effect in inter-provincial and intra-provincial trade flows for 1992 and 1997. She used an index representing the degree of domestic market segmentation. She then examined the relationship between endogenous protection and the border effect on trade. She also argued that local protectionist policy was an outcome of demand (by private agents and interest groups) and supply (politicians and government), which eventually caused increased domestic segmentation. Hence, her independent variables include fiscal expenditure, public consumption (the supply factors) and the unemployment rate (the demand factor). The regression results showed that an increase in the unemployment rate and government intervention enhanced market segmentation.

This literature is pioneering in this area, but needs further development.

First, the effect of economic opening has not been given adequate emphasis.[1] The fact is, in China, economic reform virtually coincided with the new openness

to international trade. The open economy could change the integration of the domestic market profoundly, by affecting inter-regional trade flows, the behaviour of local governments, the strategies of enterprises and people's thoughts. For example, some variables in Bai et al. (2004) and Poncet (2005), such as the share of state-owned enterprises and public consumption, are influenced by economic opening.[2] Furthermore, opening led to a decreasing government role in the economy. Therefore, simply putting economic opening into unobserved residuals could generate an omitted-variables bias in estimates.[3]

Second, the measurements used represented poorly the magnitude of domestic market integration. Bai et al. (2004) investigated the coefficient of industrial concentration as a substitute for integration. However, there is no necessarily positive correlation between industrial concentration and market integration. This needs to be analysed more closely.

Similarly, the 'border effect' derived from trade flows (Poncet 2005) needs more analysis. It is hard to distinguish other economic effects, such as resource endowment or scale economics from those of integration on trade flows. For example, little difference between resource endowments or scale of economy makes the border effect noisy. Additionally, if the products of two areas are highly substitutable, a small rise in trade costs could lead to a large reduction in inter-regional trade volume (Parsley and Wei 2001a). Therefore, these two measurements have their limitations.

Third, the two studies emphasised local protectionism, but this is extremely difficult to evaluate. Bai et al. (2004) argued that local governments benefitted from inter-regional trade barriers, so they tended to protect industries with higher past tax-plus-profit ratios and with a higher share of state-owned enterprises. Therefore, the two ratios represented the degree of local protectionism. This is doubtful, however, because local governments have incentives to protect some lower tax-plus-profit enterprises (Lin and Liu 2004).[4] Poncet (2004) claimed that local protectionism pursued a dual objective: fiscal revenue maximisation, and social stability and economic equity. She looked at the demand and supply of local protectionism, which comes from employment (unemployment rate), fiscal autonomy (fiscal expenditure) and intervention power (public consumption). Yet none of these variables equates directly to local protectionism. The unemployment rate is particularly controversial. On one hand, much of the literature debates whether China's unemployment statistics badly underestimated the real situation (Lu 2002; Wang et al. 2004; Cai et al. 2004; Xue and Wei 2004). On the other hand, provincial governments engaged in maintaining existing employment in state-owned industries, which is a latent unemployed group, rather than helping the unemployed to find new jobs.

By comparison, this chapter has three innovations. First, we use the Chinese provincial RPI to abstract the measure of China's provincial market segmentation. Second, we investigate the effects of economic opening, employment pressure, government consumption, inter-regional technology differentials and geographic distance on market segmentation. Existing studies have provided several explanations of how economic opening impacts on domestic integration. Poncet (2002, 2003b) pointed out that international trade substituted for national trade, thus economic opening fragmented the domestic market. Li et al. (2003) set up a model demonstrating that when tariffs were sufficiently low, opening made the domestic market more competitive and improved market integration. We provide new evidence on the relationship between them. Third, we eliminate simultaneity bias by putting in lagged policy variables. As for economic opening, we also use instrument variables to reduce simultaneity bias and omitted-variable bias.

In addition, our segmentation index is developed from a convincing theoretical foundation (Parsley and Wei 1996, 2000a, 2001b). It presents new evidence of an integrated Chinese domestic goods market, consistent with the findings of Naughton (1999), Xu (2002) and Bai et al. (2004), but differs from those of Young (2000) and Poncet (2002, 2003b).

The heated debate about market segmentation in China began with Young (2000), who found that provincial economic structures were increasingly similar after examining the structure of gross domestic product (GDP) and manufacturing output, per capita output of main products and some price data. The explanation was that inter-regional competition and local protection led to fragmentation of the domestic market and distortion of regional production away from local comparative advantage. Relying on the evidence that Chinese provinces were more involved in international trade with a decrease in domestic trade flow, Poncet (2002, 2003b) concluded that China's provincial borders increasingly segmented the whole country. Numerous analyses, however, took a sceptical view of such claims. The prevalent criticism was that Young's (2000) indices were too simple to capture the tendency of domestic segmentation. As we have already discussed, the measure derived from trade flow (Poncet 2002, 2003b) was noisy because many factors, such as resource endowment and scale of economy, could change the trade flow. Still a small cost of trade could lead to a large reduction in trade volume if the substitution effect was strong (Parsley and Wei 2001a).

Naughton (1999) compared the commodity composition of inter-provincial trade between 1987 and 1992. He revealed that the increase of trade volume was caused mainly by the rise in intra-industry trade within manufacturing

(final goods), rather than the trade of intermediate inputs. This coincides with the observed competition among producers in different regions. Xu (2002) decomposed provincial sectoral real value-added growth into common national effects, industry-specific effects and province-specific effects by an error-components model. The empirical analysis for the period from 1991 to 1998 showed that with significant co-movements in the long term, even province-specific factors still accounted for 35 per cent of the variance of short-term real output growth. His results suggested that the provincial economy was integrated incompletely under the reforms. Finally, the findings of Bai et al. (2004) also supported an increase in Chinese market integration: in the period from 1985 to 1997, the concentration of Chinese industries fell initially, and then increased significantly. As we pointed out, however, industrial concentration is not equivalent to market integration.

These debates have relied on indirect measures from production structure, trade flow, prices and industry concentration. In fact, the previous literature has used 'relative prices' to abstract direct indices of integration in two ways. Fan and Wei (2006) first applied the Augmented Dickey-Fuller (ADF) test to time series of each category of Chinese goods, then used the MW Test (Maddala and Wu 1999) on unbalanced panel data as a whole. According to the parameters of the model, they estimated the half-life for price convergence, which offered strong evidence of price convergence and market integration in China. Such a finding sits well with the view that China's transition to a market economy has been quite successful during the past two decades. Nevertheless, their analysis illuminated only the status of competition in the domestic market and not the course of convergence, so it cannot be extended to further research on causes of integration.

Here, we follow Parsley and Wei's model (1996, 2001a, 2001b) to observe the variance of relative price, $Var(P_i/P_j)$. Small $Var(P_i/P_j)$ implies that the relative price is falling. We can take the relative price as a dynamic index of market integration. The details will be demonstrated in a later section.

The determinants of China's domestic integration

Numerous publications have argued that Chinese market integration is affected by the behaviour of local governments. After decentralisation and taxation system reform, local governments had the chance to obtain rents from local firms' profits, so they had an incentive to reinforce regional segmentation. Hence, we group the potential determinants into three categories. The first is economic opening, the key of this chapter. The second includes factors related to government behaviour. The last covers other factors that need to be controlled.

To the best of our knowledge, economic opening has multiple impacts on market integration, some of which are positive, and others negative. First of all, in a relatively closed economy marked by low-level opening and a high tariff rate, local governments can implement segmentation policies to protect their industries. In this sense, a decrease in inter-provincial trade intensity is accompanied by rapid international trade opening (Poncet 2002, 2003b, 2005). As the economy opens further and tariff rates fall, however, the cost of local protection and segmentation augments this because of competition, and eventually international trade liberalisation restrains local protectionism (Li et al. 2003). Second, by influencing the external situation that local governments face, economic opening accelerates integration indirectly. For example, when the economy opens further, more foreign investments enter and the behaviour of individuals is transformed in diversified enterprises. As a result, the power of non-state enterprises increases and the economic intervention of the government fades.

Meanwhile, much foreign capital is invested in joint ventures. Jointly operated industrial groups need to cooperate with local governments. Furthermore, opening has an irreversible effect on people's thinking, such as their understanding of government: the public pushes local governments to remedy their welfare functions and to facilitate domestic integration. Therefore, there might be a non-linear correlation between economic opening and domestic integration. In this story, when opening is in its initial stages, it could strengthen market segmentation, but further opening could enhance domestic market integration. Finally, opening promotes domestic integration. The evidence for this will be shown in the next sections.

There are also some issues concerning local governments. Briefly, Chinese local governments have dual objectives: to optimise their benefits and to maximise the utilities of residents. For the first goal, they tend to implement segmentation policies for increased fiscal revenue. For the second one, they engage in maintaining employment and developing strategic industries. Therefore, we pay attention to the following determinants in our empirical model.

- Economic intervention of local government. In a planned economy, the fiscal system is highly centralised. Since 1978, fiscal decentralisation of revenue, taxation, control of enterprises, investment and financing has strengthened the capability of official intervention. Under this system, policymakers gain benefits from the local economy, so they have an incentive to participate in economic activities directly. Our hypothesis is that provinces with a larger share of fiscal revenue relative to the size

of the economy are more willing than others to segment inter-regional markets to protect their industries.

- Economic nationalisation. In a transitional economy such as China's, maintaining employment is always a primary government objective. China's employment pressure comes directly from local state-owned industries. Historically, the pre-reform employment system disguised large urban unemployment in the state-owned sector. In the 1990s, a shortage of capital brought about increasing deficiency of non-labour investment. There were more and more redundant workers in state-owned enterprise as a result of intense goods market competition, shrinking demand, wage rises in non-state-owned counterparts and the constraint of reducing the number of employees (Dong and Putterman 2002). So, we take the state-owned employment share as the weight of the nationalised economy, which shows the employment pressure and therefore the pressure of domestic segmentation. The noteworthy point is that there are some alternative explanations for the correlation between economic nationalisation and domestic segmentation, such as state-owned capital being commanded by local governments (Ping 2004), or local governments benefitting from state-owned enterprises (Bai et al. 2004).
- The inter-regional technology differential. Lu et al. (2004) argued that the fiscal target and employment goal was not the only explanation for duplicative industries and inter-regional economic segmentation. If high-tech industries have increasing returns, less-developed regions will not specialise according to static comparative advantage but will raise their bargaining position by inter-regional segmentation and by developing 'strategic' industries. Thus, they could gain a higher bargaining position in the future and even catch up with the rich regions. Therefore, we expect that the less-developed regions prefer a segmented economy and protect local strategic industries.

Last but not least, two factors must be controlled for in the empirical models.

- Geographic distance. In general, long distances mean high transportation costs, then more transaction costs. Even if governments are neutral, the commodity flow is still restricted by geographic space. We think distance might 'create' market segmentation.
- The stage of marketisation reform. China's marketisation could be divided into two stages. Before 1994, the process was relatively sluggish. In 1993, the third session of the fourteenth Congress of the Communist Party

of China enacted a decision to establish a socialist market economy. Taxation system reform, unification of exchange rates, financial system reform, state-owned enterprise reform and some other reforms began the next year. Therefore, 1994 was the starting point of the new phase of China's marketisation reform. From then on, the evolution of domestic goods market integration might be different from the pattern demonstrated in the period before 1994.[5] We hypothesise that the post 1994 reforms saw an increased level of market integration.

The measure of market segmentation for Chinese domestic goods

How to find a credible measure of integration or segmentation is the most difficult part of empirical studies. Given the drawbacks of the existing approaches—production, trade flow and the specialisation index—we construct the panel data of the inter-regional segmentation index using regional RPI of consumer goods by the method of Parsley and Wei (2001a, 2001b).

Datum and index computing

The logic of measuring market segmentation by relative prices is based on the iceberg model (Samuelson 1954), which amends the original Law of One Price (LOP) theory. Generally, there are certain kinds of transportation costs, such as freight costs, that are consumed during transactions like an iceberg melting. Only a fraction of the goods' value survives. This implies that perfect arbitrage requires only the relative price fluctuating within a range but not being constant. Suppose Pi is the price of a product in location 'i', and Pj is its price in location 'j'. The proportional transaction cost (wastage occurring as commodities are traded between two regions) is 'c' ($0<c<1$). The necessary condition for the existence of arbitrage is $Pi(1-c)>Pj$ or $Pj(1-c)>Pi$, in which trade occurs. Otherwise, the relative price of product Pi/Pj falls into a non-arbitrage range [1-c, 1/(1-c)]. Here, the transaction cost in a broad sense includes all sorts of factors that wear down the value of goods in the process of trade, such as physical geography or institutional arrangements. Under this principal, a reduction of freight costs or a decrease in institutional trade barriers reduce transaction costs and improve market integration; correspondingly, the range of fluctuation of the relative price shrinks.

Our primary data are retail price indices of commodities by region obtained from the *China Statistical Yearbook* for various years. We calculated 17 years (1985 – 2001) with 61 pairs of conjoint provinces' relative price variances, $\mathrm{Var}(P_i^t/P_j^t)$. The total number of observations is 1,037 (17×61). Because $\mathrm{Var}(P_i^t/P_j^t)$ data are time series for every conjoint province pair, we can observe their movements

by region. The evolution of time series reflects the tendency of goods market integration. Additionally, Parsley and Wei's (2001b) approach has another virtue. By synthesising the price information of various goods, we get the estimate of goods market segmentation.

Our study starts with relative price variances of conjoint province pairs, because these kinds of data can be synthesised to provincial segmentation indices (see the next section). In the real story of national trade, the provincial trade policy is generally consistent between neighbouring and other provinces, so when domestic integration increases, the trend might be shown first in conjoint province pairs. Such common sense is, however, difficult to prove.

We focus on the absolute value of the relative price $\left|\Delta Q^k_{ijt}\right|$, where $\Delta Q^k_{ijt} = \mathrm{Ln}(P^k_{it}/P^k_{jt}) - \mathrm{Ln}(P^k_{it-1}/P^k_{jt-1})$ [6] is the first-order difference of percentage price difference of identical product 'k' in two conjoint provinces, 'i' and 'j', at time 't'. We construct this form of relative price index from the retail price indices of commodities by region according to Equation 1; it demonstrates how indices P^k_{it}/P^k_{it-1} and P^k_{jt}/P^k_{jt-1} transform to ΔQ^k_{ijt},

$$\Delta Q^k_{ijt} = \ln(P^k_{it}/P^k_{jt}) - \ln(P^k_{it-1}/P^k_{jt-1}) = \ln(P^k_{it}/P^k_{it-1}) - \ln(P^k_{jt}/P^k_{jt-1}) \qquad (1)$$

Further, when a market is segmented, it is the extreme case that the iceberg cost, 'c', reaches a maximum; eventually Q^k_{ijt} will converge along with ΔQ^k_{ijt}. In this respect, Q^k_{ijt} is equivalent to ΔQ^k_{ijt} in describing the process of segmentation. The problem is, for any province pair or time period, ΔQ^k_{ijt} could be positive or negative. In fact, in the same year and with the same province pair, taking the price of 'i' or 'j' province as numerator, our results are opposites: that is, $\Delta Q^k_{ijt} = -\Delta Q^k_{jit}$. That is to say, the order of provinces affects the value of $\mathrm{Var}(\Delta Q_{ijt})$. The absolute value avoids this kind of inconsistency. Looking back at the iceberg model, the logarithm of the non-arbitrage interval, [1-c,1/(1-c)], is symmetrical, $[\mathrm{Ln}(1\text{-}c), \text{-}\mathrm{Ln}(1\text{-}c)]$. It implies that the opposite number of ΔQ^k reveals the same extent of relative price fluctuation, but arbitrage happens in the reverse direction with different signs of ΔQ^k.

The method of relative price analysis requires a three-dimensional database (t×m×k), where the indices 't', 'm' and 'k' represent time, province and goods respectively. Our primary data are the retail price indices of commodities by region, three-dimensional panel data (17×28×9) covering 17 years from 1985 to 2001, 28 provinces, municipalities or autonomous regions and nine commodities. Our filtration rules of goods are as follows.

- 1985 is the starting year, because there were no RPI statistics by region before 1985, and 1985 was the first year of the price reform after the third

session of the twelfth Congress of the Communist Party of China. From then on, prices were decided mainly by the market.

- Three provinces—Hainan, Chongqing and Tibet—are excluded due to incomplete data.[7]
- The old commodity categories listed only before 1985 are excluded.

Therefore, the data in this chapter include nine types of goods with continuous records: grain; fresh vegetables; beverages, tobacco and liquor; garments, shoes and hats; traditional Chinese and Western medicines; newspapers and magazines; stationery and sports goods; daily use articles; and fuel. 4) There was a commodity reclassification after 1987 with minor adjustments, so in order to get as much data as possible, we fill in the data for beverages, tobacco and liquor; garments, shoes and hats; traditional Chinese and Western medicines; newspapers and magazines; stationery and sports goods in 1985 and 1986 with data for tea, tobacco and liquor; clothes; medicines and medical equipment; newspapers and magazines; stationery and entertainment goods, respectively.

According to the computation above, we get the vectors of the differential in the relative price index, $\left|\Delta Q_{ijt}^{k}\right|$, containing 9,333 (9×61×17) observations without missing data. It is still a little far from the segmentation index. We need to calculate the cross-sectional variance with respect to goods. Under our assumption, a higher variance means a wider arbitrage interval and implies more serious segmentation.[8] With the purpose of abstracting regional effects, we must remove the goods-specific effects first. For instance, in a certain period, the grain market experiences significant price fluctuation within two locations, 'i' and 'j'. The cause could be divided into two parts: one is related to the nature of the grain market (for example, the price of grain changes markedly, since grain yields are easily influenced by natural conditions); the second is independent of the characteristics of goods, but determined by market conditions between locations 'i' and 'j', or some random factors. For instance, location 'i' is hit by a natural calamity, so the grain price jumps, or the local government of 'i' strengthens trade barriers. If we calculate the variance without filtering the goods-specific effects from $\left|\Delta Q_{ijt}^{k}\right|$, the result could overrate the real value caused by inter-regional trade barriers. We use de-mean to remove the goods-specific effect: let $\left|\Delta Q_{ijt}^{k}\right| = a^{k} + \varepsilon_{ijt}^{k}$ (Parsley and Wei 2001a, 2001b), where a^{k} is a kind of fixed effect of goods, 'k', and ε_{ijt}^{k} represents the regional specific effects between locations 'i' and 'j'. In fact, $a^{k} = \overline{\left|\Delta Q_{t}^{k}\right|}$, the mean of $\left|\Delta Q_{t}^{k}\right|$, for 61 province pairs at time 't' and for goods 'k'. Then de-mean yields $\left|\Delta Q_{ijt}^{k}\right| - \overline{\left|\Delta Q_{t}^{k}\right|} = (a^{k} - \overline{a^{k}}) + (\varepsilon_{ijt}^{k} - \overline{\varepsilon_{ijt}^{k}})$. Let $q_{ijt}^{k} = \varepsilon_{ijt}^{k} - \overline{\varepsilon_{ijt}^{k}} = \left|\Delta Q_{ijt}^{k}\right| - \overline{\left|\Delta Q_{t}^{k}\right|}$.[9] Finally, our

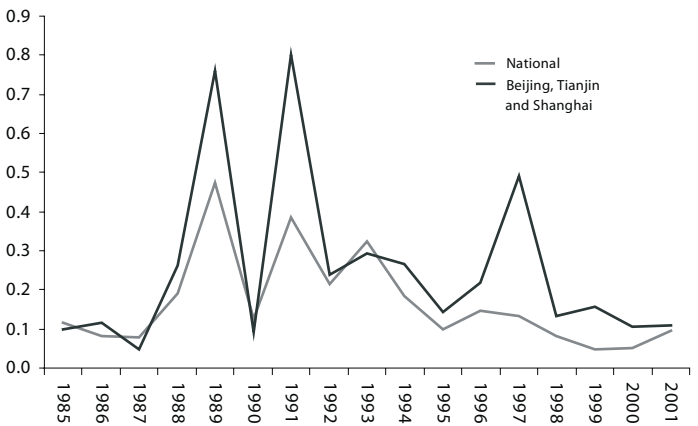
segmentation index is the variance of q_{ijt}^{k}, defined as Var(q_{ijt}^{k}). As the preceding shows, q_{ijt}^{k} is related only to regionally specific effects and other random effects and we have a total of 1,037 (61×17) observations.

The integration of the Chinese domestic goods market

Based on our segmentation index, we can summarise the integration evolution process of each region and the whole country. In the first place, we compute the average segmentation level for regions by year. The result is a time series containing 17 years' data. We can detect an oscillatory path in the period 1985–2001 in Figure 18.1. The aggregate segmentation index first rises and eventually falls, which demonstrates that China's goods market is integrating gradually. This is the opposite finding to Young (2000) and Poncet (2002).

The purpose of this chapter is to verify that economic opening and other variables will affect domestic market integration via the behaviour of local governments. Thus we need to transform the data by 61 province pairs to data by province. For example, the segmentation index of Shanghai is the mean of the inter-regional index of Shanghai–Jiangsu and Shanghai–Zhejiang. Other regional segmentation indices are created following the same logic, so we get 476 (28×17) observations. They present the movement of goods market segmentation of 28 regions in 17 years. Authentically, the provincial

Figure 18.1 **Domestic goods market segmentation, 1985–2001**



Source: Authors' calculations.

segmentation index captures the magnitude of integration between this province and all its neighbours. Figure 18.2 depicts the individual region's segmentation indices. There is a great diversity of movements, some of which are insignificant in certain regions such as Sichuan (23) and Guizhou (24), but as a whole, the trends coincide with that of the whole country: most regions' goods markets are converging to a certain level of integration.

Finally, we calculate the average index for years by region. There is great diversity across different areas (Table 18.1). A noticeable point is the three municipalities of Beijing, Tianjin and Shanghai—rank first, second and fourth respectively. Some municipalities enjoy special policies, have a better economy and a smaller area, so local government interventions work better. Hence, their market integration is relatively slower than others. Focusing on the rankings between 1985 and 2001, another point of view is that the ranks of most regions change dramatically.

Data and estimation

Now we turn to the theoretical frame and determinants discussed in section three. We begin our formal investigation with the basic model

$$\mathrm{Segm}_{it} = c + \Sigma\beta_k X_{kit-1} + \gamma_1 \mathrm{Area} + \gamma_2 \mathrm{Dummy94} + \alpha_i + \varepsilon_{it} \qquad (2)$$

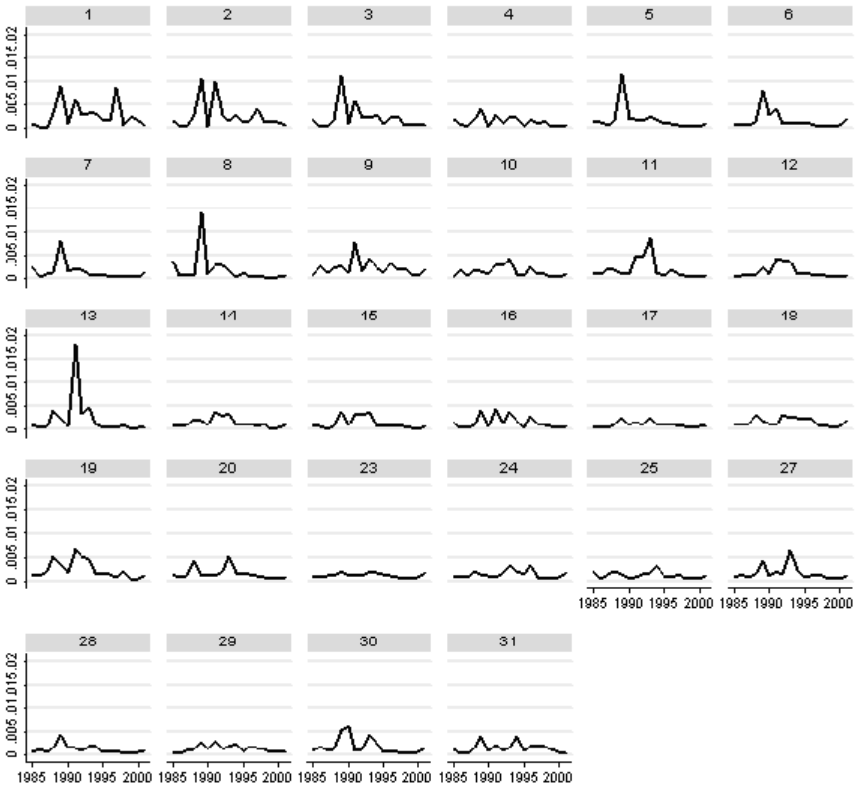
Let Segm_{it} be the segmentation index of region 'i' at time 't'. As we mentioned, it is a dimensionless variable, so our final dependent variables are 100 times the original ones; this treatment helps us get larger estimated parameters. The improvement of integration occurs with the smaller Segm value. So, variables with negative parameters promote integration; those with positive parameters impede integration.

The right hand side of Equation 2 lists our independent variables. The primary data in period 1985–98 were obtained from *Comprehensive Statistical Data and Materials in 50 Years of New China* (National Bureau of Statistics 1999); the remaining data for 1999–2001 were obtained from *China Statistical Yearbooks*. Our sample covers 28 regions. The data for Sichuan Province do not include Chongqing.[10] The statistics for Hainan, Tibet and Chongqing were incomplete for 1985–2001, so were not included in our sample.

'X' is the vector of policy variables influencing local government decisions. These variables are endogenous due to simultaneity bias, for which we use the one-year lag of Xs to treat. The entries of X include

- *Trade*—the share of total international trade in GDP—or the dependency ratio of international trade[11]—denotes the degree of economic opening.

Figure 18.2 **Market segmentation index by region, 1985–2001**



1 Beijing
2 Tianjin
3 Hebei
4 Shanxi
5 Inner Mongolia
6 Liaoning
7 Jilin
8 Heilongjiang
9 Shanghai
10 Jiangsu
11 Zhejiang
12 Anhui
13 Fujian
14 Jiangxi
15 Shandong
16 Henan
17 Hubei
18 Hunan
19 Guangdong
20 Guangxi
21 Hainan
23 Sichuan
24 Guizhou
25 Yunnan
27 Shaanxi
28 Gansu
29 Qinhai
30 Ningxia
31 Xinjiang

Note: The trade/GDP ratio with one year lag is used as an explanatory variable in the regression. To make the figure readable, the original data multiplied by 100 are reported.
Source: Authors' calculations.

Table 18.1 **Ranking of segmentation index by region**

Province	Means over 17 years	Rank	1985	Rank	2001	Rank
Beijing	0.273	1	0.099	14	0.057	22
Tianjin	0.260	2	0.152	7	0.078	14
Fujian	0.240	3	0.102	13	0.051	25
Shanghai	0.233	4	0.05	26	0.195	1
Guangdong	0.233	5	0.135	9	0.091	11
Hebei	0.217	6	0.164	6	0.046	27
Zhejiang	0.197	7	0.092	16	0.074	17
Heilongjiang	0.194	8	0.393	1	0.068	20
Inner Mongolia	0.175	9	0.117	10	0.108	8
Ningxia	0.166	10	0.074	21	0.141	6
Hunan	0.166	11	0.087	17	0.191	2
Shaanxi	0.164	12	0.076	19	0.104	10
Henan	0.157	13	0.182	4	0.072	19
Liaoning	0.153	14	0.081	18	0.169	4
Guangxi	0.152	15	0.142	8	0.074	16
Jiangxi	0.148	16	0.113	11	0.089	12
Jiangsu	0.147	17	0.038	27	0.087	13
Xinjiang	0.143	18	0.092	15	0.033	28
Jilin	0.142	19	0.244	2	0.124	7
Anhui	0.141	20	0.035	28	0.055	23
Guizhou	0.137	21	0.108	12	0.185	3
Shanxi	0.134	22	0.174	5	0.049	26
Shandong	0.131	23	0.075	20	0.052	24
Qinhai	0.124	24	0.063	23	0.064	21
Yunnan	0.115	25	0.206	3	0.105	9
Gansu	0.113	26	0.056	25	0.074	18
Sichuan	0.109	27	0.067	22	0.169	5
Hubei	0.106	28	0.059	24	0.076	15

Source: Authors' ranking.

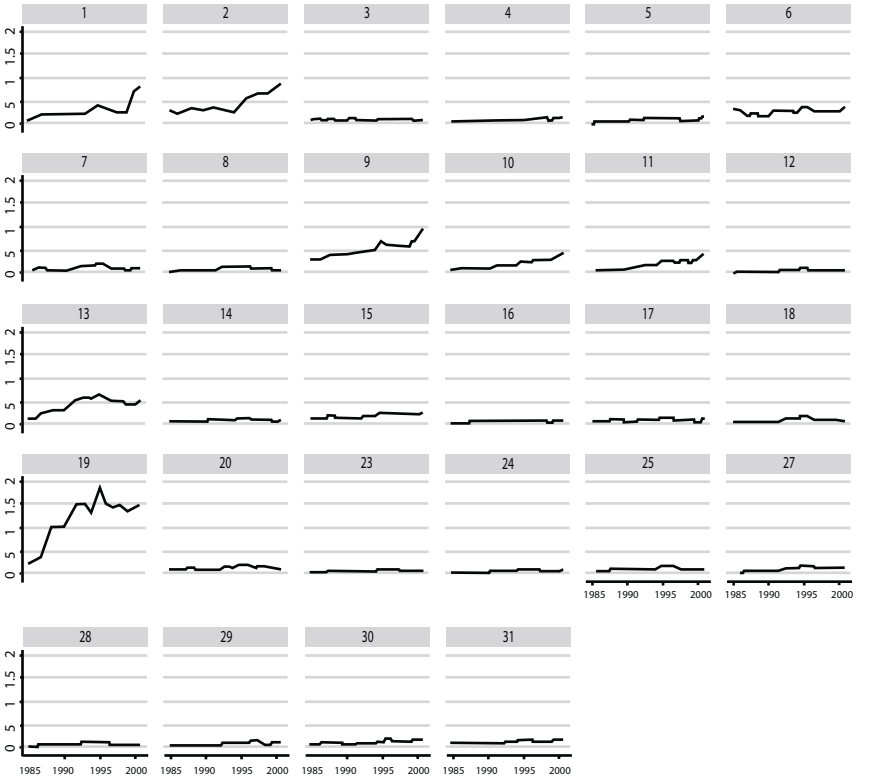
Considering that the effect is in non-linear form, we construct the quadratic term of opening (*Tradesq*) in our model. Figure 18.3 presents the upward trend of the dependency ratio on international trade from 1985 to 2001. It is consistent with increasing economic opening. The prominent case is Guangzhou Province: in terms of the level and the rate of change, this province exceeds that of other regions. As we deduced in section three, there could be a non-linear effect of economic opening, so that the coefficient of the linear term could be positive, and that of the quadratic term could be negative.

- *Govcons*—the ratio of government consumption to GDP is the proxy of the fiscal objectives of local governments—an important motive for local protection—so we expect to detect a positive correlation between this variable and the segmentation. In empirical studies, an alternative of government interference is the ratio of provincial government expenditure to GDP.[12] We tried it in our regression and the result was consistent but less significant, so we report only the estimates with *Govcons*.
- *SOE*—the share of state-owned employees in total employees. As we mentioned in section three, this is an indicator for employment pressure and public authority in the local economy. The coefficient could be positive.
- *Techdiff*—the ratio of GDP per worker per region with that of its neighbours, which is a proxy of technology difference. The GDP per worker of neighbouring regions is the simple arithmetic mean of that of all conjoint regions, which assigns each neighbour the same weighting coefficients. Lu et al. (2004) presented a theoretical framework to prove that the less-developed regions had a motive to set segmentation, but better-developed regions pursued market integration. In this logic, the coefficient of *Techdiff* could be negative.

We also included two important control variables in our regression model

- *Area*—the average size of a region and its neighbours. We use this variable to indicate roughly the average physical size of local and conjoint provinces. *Area* = local size + (total area of neighbours ÷ the number of neighbours). Because most provinces have several neighbours, a simple straight-line distance cannot capture the nature of geographic distance. The anticipated sign of this variable is positive.[13]
- *Dummy94*—the dummy variable of time—let them be one after 1994, otherwise they equal zero. After the implementation of a series of reforms in 1994, integration could be strengthened significantly. Therefore, this variable could be negatively related with the segmentation index.

Figure 18.3 **The ratio of dependence on international trade by region, 1985–2001**



1 Beijing
2 Tianjin
3 Hebei
4 Shanxi
5 Inner Mongolia
6 Liaoning
7 Jilin
8 Heilongjiang
9 Shanghai
10 Jiangsu
11 Zhejiang
12 Anhui
13 Fujian
14 Jiangxi
15 Shandong
16 Henan
17 Hubei
18 Hunan
19 Guangdong
20 Guangxi
21 Hainan
23 Sichuan
24 Guizhou
25 Yunnan
27 Shaanxi
28 Gansu
29 Qinhai
30 Ningxia
31 Xinjiang

Note: The trade/GDP ratio with one year lag is used as an explanatory variable in the regression.
Source: Authors' calculations.

In our model, α_i is the unobservable provincial fixed effect, which is constant over time and specific to the province, 'i', and ε_{it} is the disturbance. Since the unobservable term α_i could be correlated with some independent variables, the OLS estimates are biased. One of the general ways to reduce the bias caused by omitted variables represented by the constant α_i is the method of de-mean imposed on all variables before regressions, which is the fixed effects (FE) approach. If α_i is uncorrelated with the other regressors, the random effects (RE) model is more efficient and we can test the fixed and random effects regressions by the Hausman Test to decide which of the two alternatives is better. If two coefficient estimators differ systematically, α_i is correlated with one of the explanatory variables and only the FE treatment is consistent. Otherwise, the fact that the individual effect α_i is uncorrelated with the other regressors cannot be rejected, and the efficient estimators of the RE model are better.

That α_i is constant over time is, however, a very strong assumption. Unobserved time-varying factors can cause estimators to be inconsistent, so instrument variable estimation is helpful. The results could also be tested with the Hausman Test. If the estimate of the instrument variable model is significantly different from that of the OLS estimation, the hypothesis that some of the regressors are endogenous cannot be rejected, the instrument variable estimation is consistent and the original OLS estimation is more efficient.

Results are reported in Table 18.2. The regression (1) begins with explanatory variables *Trade*, *Govcons*, *SOE*, *Area* and *Dummy94*. The Hausman Test rejects the RE estimation, so we cannot estimate the effect of physical distance (*Area*). In this model, *Govcons* and *SOE* strengthen segmentation, and the estimate of *Dummy94* shows that, after 1994, the accelerated marketisation reform caused segmentation to abate. Our results show, the coefficient of economic opening is positive, suggesting trade opening raises segmentation. For the sake of examining the effect of economic opening more precisely, we add *Tradesq* in regression (2) to capture a potential non-linear effect. The Hausman Test rejects the RE approach. Compared with (1), coefficient estimates of *Govcons* and *SOE* change slightly with this specification, but with the significant positive estimate of *Trade* and negative estimate of the quadratic term, *Tradesq*, model (2) is more compatible with our theoretical framework. The effect of opening is non-linear. At its initial stage, opening strengthens market segmentation, but further opening enhances domestic market integration. Numerically, the critical point is Trade = 1.272. Before this point, economic opening increases segmentation; after this, it increases integration. The value 1.272 falls into the observable interval; the data for Guangdong Province exceeded this level after 1991.

In the next step, *Techdiff* is added in model (3). The estimate of *Techdiff* is insignificant, but the sign is negative as the theory predicts. The negative coefficient means that lagged regions have a smaller index of *Techdiff*, and more serious market segmentation, while the better-developed regions with higher *Techdiff* have smaller segmentation magnitude. The insignificant estimate is reasonable here. Firstly, the technology difference theory works better in high-tech industries with increasing turns (Lu et al. 2004), but our explanatory variables are set up from price indices of ordinary consumer goods. Secondly, the technological difference has a long-term effect, so our one-year lagged model cannot capture this characteristic. Thirdly, like the effect of opening, the technological difference could influence segmentation in a non-linear form, but our model has only a linear term of technology.

Looking back at the results so far, we extend the study on the critical value of the inversed-U shape of the effects of economic opening. In regression (2), the point is *Trade* = 1.272, but in regression (3), the point is *Trade* = 1.043. Although these two values are within our sample, only Guangdong has exceeded that level of economic opening. We worry that the non-linear effects of opening are due only to the outliers in our sample. So the next step is to drop all observations in Guangdong from our sample, and repeat the regression (3); we get the result in column (4). The basic finding is similar, but the critical value drops to *Trade* = 0.7273, a value within our new sample. Now, we can draw the convincing conclusion that a non-linear relationship exists between economic opening and market segmentation.

Finally, considering the extraordinarily high values of the segmentation indices in the three municipalities, we drop them, and repeat the estimation. Table 18.2, column (5) reports the random effect estimates, the coefficients of regressors meet our expectation and most of them are statistically significant, except *Techdiff*.

The estimates in Table 18.2 might be biased if omitted variables contain time-varying ones. In that case, the FE and the RE are inconsistent. Table 18.3 presents the test results of instrument variable estimations. Our goal is to find the unbiased estimator of economic opening, so we implement three instrument variables.

- The pre-reform opening index in 1978, denoted as *trade78*. It is the international trade share in GDP in 1978 and represents the historical influence.
- The minimum railway distance from the capital of a region to the main Chinese ports of Hong Kong or Shanghai (denoted as *port*).[14] This instrument variable represents the geographic effect and is the valid

Table 18.2 **Market segmentation and its determinants**

Dependant variable	Segmentation				
		All regions		Guangdong excluded	Beijing, Tianjin and Shanghai excluded
	(1)	(2)	(3)	(4)	(5)
Independent variables	FE	FE	RE	RE	FE
Trade	0.2621***	0.7180***	0.5653***	0.6944***	0.7831***
	(0.0864)	(0.2073)	(0.1216)	(0.1707)	(0.2216)
Tradesq	n.a.	–0.2821**	–0.2711***	–0.4773**	–0.3067**
		(0.1167)	(0.0769)	(0.2422)	(0.1200)
Govcons	1.0059***	0.9019**	0.3449	0.3405	0.9589**
	(0.3835)	(0.3838)	(0.2648)	(0.2694)	(0.3733)
Soe	0.9279***	1.0085***	0.7199***	0.6481***	0.9876***
	(0.2174)	(0.2187)	(0.1960)	(0.2227)	(0.2235)
Techdiff	n.a.	n.a.	–0.0104	–0.0075	–0.0430
			(0.0192)	(0.0212)	(0.1060)
Area	(dropped)	(dropped)	–2.4197	–2.1790	(dropped)
			(2.0891)	(2.1210)	
Dummy94	–0.0831***	–0.0957***	–0.0969***	–0.1012***	–0.1028***
	(0.0221)	(0.0226)	(0.0209)	(0.0219)	(0.2252)
Constant	–0.8533***	–0.9692***	–0.5702***	–0.5125**	–0.9187***
	(0.2350)	(0.2386)	(0.2039)	(0.2234)	(0.2494)
Within R^2	0.1441	0.1554	0.1463	0.1351	0.1812
F-value	18.35	16.01	n.a.	n.a.	14.24
Wald chi2	n.a.	n.a.	90.68	78.82	n.a.
Hausman Test					
P-value	15.12	9.72	9.76	10.20	14.64
	0.0045	0.0835	0.1352	0.1158	0.0232
No. of observations	468	468	468	451	417
No. of regions	28	28	28	27	25

Notes: standard errors in parentheses; ***, **, * denote significance at 1 per cent, 5 per cent, 10 per cent level; the null hypothesis of the Hausman Test has no systematic difference between FE and RE models.
Sources: Authors' calculations.

Table 18.3 **Market segmentation and its determinants (instrumental variable estimation)**

Dependant variables	Segmentation			
	All regions		Guangdong excluded	Beijing, Tianjin and Shanghai excluded
	(6)	(7)	(8)	(9)
Independent variables	IV-FE	IV-RE	IV-RE	IV-FE
Trade	3.1001***	0.7202	0.5060*	3.0345***
	(0.9308)	(0.6589)	(0.2629)	(0.9454)
Tradesq	–1.5240***	–0.4635	–0.3350	–1.6581***
	(0.5826)	(0.5879)	(0.4245)	(0.6054)
Govcons	0.3820	0.3113	0.3623	0.5508
	(0.4838)	(0.2996)	(0.2763)	(0.4604)
Soe	1.7757***	0.5382*	0.5487*	1.2645***
	(0.3898)	(0.2795)	(0.2989)	(0.3160)
Techdiff	n.a.	–0.0138	–0.0030	–0.2533
		(0.0383)	(0.0282)	(0.1702)
Area	(dropped)	–1.6967	–3.0731	(dropped)
		(3.9994)	(2.2910)	
Dummy94	–0.1551***	–0.1089***	–0.1010***	–0.1616***
	(0.0358)	(0.0304)	(0.0236)	(0.0352)
Constant	–1.9349***	–0.3974	–0.4038	–1.1359***
	(0.4459)	(0.2717)	(0.2860)	(0.3761)
Within R^2	.	0.1236	0.1316	.
Between R^2	0.5373	0.4085	0.4409	0.3016
IV	portrate	trad78rate	trad78rate	portrate
Hausman Test				
P-value	8.29	1.17	1.34	6.11
	0.1410	0.9916	0.9874	0.4111

Notes: Standard errors in parentheses; ***, **, * denote significance at 1 per cent, 5 per cent, 10 per cent level; the null hypothesis of the Hausman Test is that there is no systematic difference between IV estimation and original models; the within R^2 of (6) and (9) are too small, so Stata does not report them.
Sources: Authors' calculations.

instrument variable for economic opening in Wei and Wu (2001). We compare the distances only to Hong Kong or Shanghai because they are two biggest ports in China, located in the Pearl River Delta and the Yangtse River Delta, respectively, and their throughputs are far beyond those of other ports.

- The exchange rate (denoted as *rate*) determines the international relative price directly and affects the volume of international trade of each province accordingly, but it does not influence integration directly, so it is a valid instrumental variable.

Exchange rate and international trade interplay mutually, so we use the lagged *rate* as the IV of opening. In our regression model, opening is a one-year lagged trade variable, so the *rate* IV in estimation is the two-year lagged exchange rate. The problem is, in Table 18.2, columns (2) and (5) are all FE models; IVs constant over time are eliminated in the de-mean process. So we set up two interaction terms, the interaction of *trade78* and *rate* (*trade78rate*), and the interaction of *port* and *rate* (*portrate*). These two instruments are composed of time-varying exchange rate and time-fixed regional specific or historical effects. The justification for using the interaction terms as instruments is that the effects of the instruments on economic opening depend on each other. In more concrete terms, the effects of history and geography on opening will be greater if the price of international trade is more advantageous, and the exchange rate will have more significant effects on opening in regions with better geographic and historical conditions. We have used both instrumental variables in the model alternately. All results of the Hausman Test do not reject the null hypothesis of no systematic difference between IV and the original models. Table 18.3 reports the corresponding IV models of columns (2)–(5) in Table 18.2, and the models with alternative IVs that we do not report here also reject the endogeneity of opening, so the estimates in Table 18.2 are convincing.

Conclusions

Many studies on the Chinese domestic market have provided evidence in support of the general trends of market integration as a result of economic transformation. The existence of domestic market segmentation, however, and the negative effects of local protectionism can hardly be rejected (Zhen and Li 2003; Poncet 2003a). For this reason, examining the determinants of domestic market integration is still an important issue facing researchers as well as decision makers in China.

Our empirical results answer two questions. First, has the domestic goods market become more integrated since the reforms? The segmentation index constructed by Chinese RPI data shows a different tendency from that found by Young's (2000) and Poncet's (2002) findings. The main finding is that the trend of market integration is persistent and increases over time, although such a trend also experiences serious short-term aberrations, and until now the progress in market integration has varied across different provinces.

Second, did more integrated international trade substitute inter-provincial trade and intensify domestic market segmentation, as stated by Poncet (2002, 2003b)? We investigated the incidence of trade opening, which has been a primary policy focus in Chinese economic reform. Our study captures a non-linear correlation, meaning that the opening policy could worsen the extent of market segmentation in its initial stage of development, but further opening enhances and strengthens the process and the extent of domestic market integration. Such findings endorse the view that moving towards an open economy is fundamentally conducive to the objective of building an integrated market system in China.

We also analysed the influence of geography, pressure for employment, government consumption and technology differentials. Evidence reveals that employment pressure and government consumption worsen market segmentation.

In conclusion, economic opening benefits domestic market integration. However, most provinces still have a long way to go to be integrated more into the national market system. Meanwhile, institutional reforms, such as those aimed at constraining local government intervention and continual privatisation, will help to further enhance the process of market integration in China.

Notes

1 Poncet 2004 argued that the volume of intra-provincial trade flow was not influenced by the parallel evolution of international trade. But her former paper (2003b) stated that Chinese provinces' greater involvement in international trade went hand-in-hand with a decrease in domestic trade flow intensity between 1987 and 1997.

2 In our data, economic opening has a negative correlation with the share of state-owned enterprises and public consumption.

3 Moreover, these two papers partially overlooked the simultaneity bias. In most studies of this field, however, the variables of government policy are usually correlated with market integration to different degrees; the simple way to mitigate this kind of bias is to use the lagged explanatory variables. The treatment of these two papers was incomplete. Bai (2004) considered only the lagged tax-plus-profit ratio and Poncet 2004 considered only the lagged rate of unemployment and the share of the public sector in total consumption.

4 Theoretically, a higher tax-plus-profit ratio could be the result of, rather than the motive for, local protectionism, so Bai (2004) used lagged tax-plus-profit ratios to mitigate this type of endogeneity bias.

5 Some of the literature chooses 1992, when Deng Xiaoping toured southern China, as the start point of the new stage of reform. Considering the execution time of policies, however, we think 1994 is the better division standard.

6 There are three forms of relative price in empirical studies of the iceberg model. The other two forms are the direct price ratio between two places, $\mathbf{P}_{it}^{k}/\mathbf{P}_{jt}^{k}$, and the logarithm of price ratio, $Q_{ijt}^{k} = \mathrm{Ln}(P_{it}^{k}/P_{jt}^{k})$. The main improvement in the second form is that the estimator of the independent variable is independent of the unit of measurement. Furthermore, a logarithm can mitigate the disturbance of heteroskedasticity and skewing (Wooldridge 2003). Details of the relative price forms are introduced by Parsley and Wei (1996, 2001a, 2001b).

7 The earliest data for Hainan, Chongqing and Tibet began in 1988, 1997 and 1999 respectively. Before 1987, statistics for Guangdong covered Hainan. Before 1997, data for Sichuan included Chongqing.

8 A formal discussion is presented in Parsley and Wei (2001a and 2001b).

9 Alternatively, Parsley and Wei (2001a and 2001b) used OLS regressions to remove fixed effects of $\left|\Delta Q_{ijt}^{k}\right|$. The model was $\left|\Delta Q_{ijt}^{k}\right| = \beta\left|\overline{\Delta Q_{t}^{k}}\right| + \varepsilon$ and the residual was $q_{ijt}^{k} = \left|\Delta Q_{ijt}^{k}\right| - \hat{\beta}\left|\overline{\Delta Q_{t}^{k}}\right|$, which is an inexplicable term of $\left|\overline{\Delta Q_{t}^{k}}\right|$. We can get the same result through these two approaches.

10 In *Comprehensive Statistical Data and Materials in 50 Years of New China*, all data for Sichuan peel off those for Chongqing, so Sichuan's explanatory variables do not contain the portion for Chongqing. The dependent variable of Sichuan, however, comes from the RPI that covered Chongqing before 1996. We suppose the RPI of one area will not change much if peeling off only a portion of it. For more sample numbers, we keep these 11 components.

11 The data for imports and exports are the values in renminbi transferred by middle prices for the renminbi–US dollar. The exchange rates were obtained from *China Statistical Yearbooks*.

12 In the literature on economic growth, the government expenditure to GDP ratio—with expenditure for education and national defence subtracted—is used commonly as the proxy of government interference. But Chinese local governments have no statistics on national defence, and there is no separate category for education—only total numbers of expenditure for culture, education, research and health—so we subtracted the share of expenditure for culture, education, research and health from total government expenditure.

13 The study of Head et al. 2002 measured the distance by $0.376\sqrt{\mathrm{Area}}$, where 'Area' denoted the numerical value of area. The calculation strategy was based on the assumption of a uniform distribution of consumers. We also used this index in regressions, and the conclusions were the same as the ones we report.

14 Shenzhen is one of the largest ports in China, but it is close to Hong Kong, so the distances from provincial capitals to Hong Kong are also the distances to Shenzhen. These data were collected from the *China Electronic Map for Transportation and Travel* (Beijing Tuling Software Ltd). We acknowledge Yu Jin's help for data collecting.

References

Bai, C.E., Du, Y., Tao, Z. and Tong, S.Y., 2004. 'Local protectionism and regional specialization: evidence from China's industries', *Journal of International Economics*, 63(2):397–417.

Cai, F., Wu, Y., Giles, J. and Park, A., 2004. 'How does economic integration affect urban employment and welfare' (in Chinese), *China Labor Economics*, Chinese Labor and Social Security Publishing House, 1(1):1–32.

Dong, X. and Putterman, L., 2002. 'Investigating the rise of labour redundancy in China's state industry' (in Chinese), *China Economic Quarterly*, 1(2):397–418.

Fan, C.S. and Wei, X., 2006. 'The law of one price: evidence from the transitional economy of China', *The Review of Economics and Statistics*, MIT Press, 88(4):682–97.

Head, K. and Mayer, T., 2000. 'Non-Europe: the magnitude and causes of market fragmentation in the EU', *Weltwirtschaftliches Archiv*, 136(2000):284–314.

Li, J., Qiu, L.D. and Sun, Q., 2003. 'Interregional protection: implications of fiscal decentralization and trade liberalization', *China Economics Review*, 14:227–45.

Lin, Y. and Liu, P., 2004. *Local protection and market segmentation: the angle from development strategy*, (in Chinese), Working Paper, No. C2004015, China Center for Economic Research, Peking University, Beijing.

Lu, M., Chen, Z. and Yan, J., 2004. 'Increasing returns, development strategy and regional economic segmentation', *Studies in Regional Development*, 36(1):275–306.

Lu, M., 2002. *Labor Economics: a perspective of the modern economic system* (in Chinese), Fudan University Press, Shanghai.

Maddala, G.S. and Wu, S., 1999. 'Comparative study of unit root tests with panel data and a new simple test', *Oxford Bulletin of Economics and Statistics*, 61:631–52.

Naughton, B., 1999. How much can regional integration do to unify China's markets?, Paper presented at the Conference for Research on Economic Development and Policy Research, Stanford University, Palo Alto.

National Bureau of Statistics, 1999. *Comprehensive Statistical Data and Materials on 50 Years of New China*, China Statistics Press, Beijing.

Parsley, D.C. and Wei, S.J., 1996. 'Convergence to the law of one price without trade barriers or currency fluctuations', *Quarterly Journal of Economics*, 111:1,211–36.

——, 2001a. 'Explaining the border effect: the role of exchange rate variability, shipping cost, and geography', *Journal of International Economics*, 55(1):87–105.

——, 2001b. *Limiting currency volatility to stimulate goods market integration: a price based approach*, NBER Working Paper 8468, National Bureau of Economic Research, Cambridge, MA.

Ping, X., 2004. 'The motivation and effect of government protection—an empirical analysis', (in Chinese), *Finance and Trade Economics*, 5:3–10.

Poncet, S., 2002. 'Is China disintegrating? The magnitude of Chinese provinces' domestic and international integration' (in Chinese), *World Economic Papers*, 1:3–17.

——, 2003a. 'Domestic market fragmentation and economic growth in China', paper presented at the 43rd European Congress of the Regional Science Association, Jyvsky, Finland, 27–30 August.

——, 2003b. 'Measuring Chinese domestic and international integration', *China Economic Review*, 14(1):1–21.

——, 2005. 'A fragmented China: measure and determinants of Chinese domestic market disintegration', *Review of International Economics*, 13(3):409–30.

Samuelson, P., 1954. 'Theoretical notes on trade problems', *Review of Economics and Statistics*, 46:145–64.

Wang, D., Wu, Y. and Cai, F., 2004. 'Migration, unemployment and urban labor market segmentation' (in Chinese), *World Economic Papers*, 1:37–52.

Wei, S. and Wu, Y., 2001. *Globalization and inequality: evidence from within China*, NBER Working Paper 8611, National Bureau for Economic Research, Cambridge, MA.

Wooldridge, J.M., 2003. *Introductory Econometrics, A Modern Approach*, South-Western, Thomson Learning, Mason, OH.

Xu, X., 2002. 'Have the Chinese provinces become integrated under reform?', *China Economic Review*, 13:116–33.

Xue, J. and Wei, Q., 2004. 'Urban unemployment and poverty in China' (in Chinese), *China Labor Economics*, Chinese Labor and Social Security Publishing House, 1(1):58–71.

Young, A., 2000. 'The razor's edge: distortions and incremental reform in the People's Republic of China', *Quarterly Journal of Economics*, CXV:1,091–135.

Zhen, Y. and Li, C., 2003. 'The efficiency loss in China's regional segmentation' (in Chinese), *Chinese Social Science*, 1:64–72.

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