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**Incremental Reform and  
Distortions in China's Product and Factor Markets**

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## ABSTRACT

The purpose of reform is to reduce distortions in the economic system and enhance efficiency. However, along with incremental partial reforms, local governments or individuals often have the chance to capture the rent inherent in the gradual transition process. Young (2000) warned that this rent-seeking behavior might lead to increasing market fragmentation. Empirical studies have shown the opposite in the product market. In this paper we argue that as the rent from the product market has been squeezed out due to deepening reforms, rent-seeking behavior may have shifted to other sectors, in particular to the capital market. The key is to conduct further reforms in the capital market to squeeze out rent seeking opportunities as those from the product and labor markets have been squeezed out earlier.

JEL Keywords: Reform, China, Rent Seeking, Factor and Product Market, Transition.  
JEL Classification Code: D33, D61, D63, O11, O53, P23.

## **I. Introduction**

Over the past 25 years, China's transformation from a centrally planned to an increasingly market driven economy has led to substantial efficiency gains and rapid economic growth (Maddison, 1998; Fan, Zhang and Robinson, 2003). However, as Young (2000) has argued, the reforms may not have been sufficiently complete to improve domestic market integration. This could happen, for example, if increased inter-regional competition due to fiscal decentralization led local governments to impose a variety of trade protection measures against each other. Young's work has stimulated a series of studies to investigate trends in market integration. A recent survey by the Development Research Center of the China State Council (2003) indicates that China's domestic product markets have actually become more rather than less integrated. Measures of regional protection have also declined significantly over the past decade. Wei and Fan (2004) show that output prices have become more integrated. Huang *et al.* (2003) use evidence from the rice market to argue that China's commodity markets are becoming increasingly integrated as a result of the reforms. Based on a panel data set of 32 two-digit industries in 29 provinces, Bai *et al.* (2004) show that after an initial decline, there was an increase in regional specialization of industrial production, suggesting diminishing impediments to regional trade flows. These findings would appear to contradict Young's predictions about worsening market fragmentation.

Aside from final goods market, it is also possible that distortions occur in the factor markets. de Brauw *et al.* (2002) show that there has been a huge transfer of rural labor from the low-productivity farming sector to high-productivity nonfarm sectors over the past two decades, suggesting a shift towards a more integrated rural labor market. By examining labor flows across provinces using the population censuses of 1990 and 1995, Poncet (2003)

concludes that the interprovincial border barriers to labor migration have declined from the 1980s to the 1990s. Zhang *et al.* (2005) found that the returns to education in the non-public enterprise caught up with those in the state-owned enterprise, indicating increasing labor mobility across sectors. Yet, numerous studies (Meng, 2000; Knight and Li, 2005) suggest that there are still significant segmentations in the labor market.

China has made various reforms in the financial market, such as the establishment of stock market and regionalization of major banks. Yi (2003) argues that these reforms have made China's financial market more efficient. However, several empirical studies reach the opposite conclusions. Fan, Robinson, and Zhang (2003) have found that the provincial marginal rates of return to capital in agriculture, urban industry, urban services, and rural enterprises have diverged since 1985. Boyreau-Debray and Wei (2003) use two methods to test the degree of capital market fragmentation based on provincial data from 1978 to 2000. The first approach is to examine the correlation of local savings and investment. Under an integrated capital market, the correlation should be low. The second approach, drawing from the risk sharing literature, is to check the degree of consumption smoothing across time and space, which is an important indicator for measuring capital mobility and asset market completeness. Both approaches show that the capital market has become more fragmented.<sup>1</sup>

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<sup>1</sup> Some of the recent reports on rent seeking activities in the banking and real estate sectors include Yang Xiuzhu, vice chief of the construction department of Zhejiang Province who extracted bribes from property developers and disappeared (Caijing, July 23, 2003); Chen Kai, a local government official of Fuzhou, Fujian Province, who borrowed an estimated \$50 million from six state banks and provided kickbacks of around 5 percent of the loans to the lending officers (Washington Post, December 17, 2003), Shanghai real estate tycoon; Zhou Zhengyi, who was implicated in an array of illegal loans coupled with default on statutory compensations for relocatees whose homes were improperly demolished for redevelopment projects (Shanghai Daily, September 6, 2003); former chairman of China Everbright Group, Zhu Xiaohua who was sentenced to jail for 15 years in November 2002 for taking bribes worth 4 million yuan (Caijing, December 25, 2003); Zhu Yaoming, a stock speculator who was arrested in July 2003 for loan fraud involving 2 billion yuan which he borrowed from securities firms and banks to speculate on stocks in the Shanghai and Shenzhen stock exchanges (Caijing, December 25, 2003). Numerous Communist Party officials have also been ousted for accepting bribes involving property and real estate projects. They included former CCP general secretary of Guizhou province, Liu Fangren; former CCP general secretary of

In summary, the empirical literature on the extent of and trends in markets fragmentation is inconclusive. Most previous studies focus only on either product or factor markets for a short time period. The objective of this paper is to document the evolution of both product and factor market development using a more integrated framework over a longer period covering the entire course of economic transition and reforms. To assess the degree of factor market fragmentation, we divide the economy into four sectors: urban industry, urban services, agriculture, and rural enterprises.<sup>2</sup> Our analysis is based on estimating production functions for each sector, using provincial time series data for 1978-2001. One side contribution of our analysis is the computation of a capital stock series by sector, using fixed investment data from the National Bureau of Statistics that are not yet fully publicly available. We use our estimated parameters from the regression equations to quantify the regional variation in the marginal products of capital and labor by sector. The results confirm that labor markets are becoming more integrated, but also show that capital markets have become more fragmented. As the reforms in the product markets have deepened, the former distortions do seem to have shifted to the capital market. In this sense, Young's argument is still valid: in a partially reformed economy, distortions may beget more distortions. However, the distortions may not necessarily stay in the same sector.

The paper is organized as follows. We first review the history of market development in the second half of the twentieth century. Next, we present data on changes in labor and capital productivity across sectors and regions in the Chinese economy over recent decades. The fourth section presents the trend in product market

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Hebei province, Cheng Weigao; former Minister of Land and Resources, Tian Fengshan, as well as a former vice mayor of Shenzhen Cty and the former mayor and a vice mayor of Shenyang City.

<sup>2</sup> The rural enterprise sector includes all non-farm activities such as rural industry, construction, transportation, and commerce.

integration. In the fifth section, we quantify regional variations in the marginal products of capital and labor, which serve as good indicators of factor market integration. We then simulate the efficiency gains for economic growth if the current barriers to factor flows across regions and sectors are removed. The paper closes with our conclusions and suggested policy implications. Appendix I provides additional details about our data.

## **II. Market Development in China**

### *Product market:*

Market fragmentation has a long history. In the early 1950s, China adopted a “self-sufficient” agricultural and industrial policy at both the national and provincial level (Lin, Cai, and Li, 1996). Under the autarky policy, provinces were encouraged to develop their own industries and ensure enough grain production. However, the underlying economic structure was often inconsistent with a region’s comparative advantage. Therefore a local government must impose various protections to the local products. The planning system led to serious shortages in final goods, forcing the government to impose rationing on consumers as well.

Since the economic reform in the late 1970s, China has decentralized its fiscal system in order to provide more incentives for local government to develop its economy (Zhang, 2006). Under the fierce inter-judiciary competitions as a result of fiscal decentralization, interest groups in provinces, cities, and countries were eager to protect their own local interests. Serious trade wars between regions occurred in the 1980s and the early 1990s (Young, 2000). In responding to the crises of regional trade blockades, the National People’s Congress passed the “Law on Unjust Competition” in 1993. The

State Council issued an order No. 303 “Stipulation of the State Council to Forbid Regional Blockade in Market Activities” in 2001.

*Labor market:*

In the 1950s, the government established the *Hukou* system of household registration in this period, confining people to the village or city of their birth, in order to ensure there was enough agricultural labor to produce sufficient grain to support the industrial and urban sector. Consequently, the rural and urban labor markets became totally segmented and a large rural-urban divide was formed (Yang and Fang, 2000).

Since the 1980s, China has gradually reduced institutional barriers to migration.<sup>3</sup> In 1983, farmers were allowed to engage in long distance transport and marketing of their products beyond local market places. In 1988, the central government permitted farmers to work in cities under the condition of self-sufficient staples. Since the early 1990s, various measures of relaxing the *hukou* system are introduced to encourage rural-to-urban labor mobility. For example, some cities have adopted a selective migration policy by issuing permanent residency to those migrants who paid certain amount of money or invested in local business or bought expensive house in the cities. In addition, the urban reforms, such as the removal of rationing, expansion of urban non-state sectors, the reform in housing, employment policies, and social security system, have made it possible for migrant workers to live in cities.

Despite the progress in reducing the institutional barriers to labor mobility, there are still some obstacles seriously impeding population migration across regions (Fleisher

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<sup>3</sup> Fleisher and Yang (2003) and World Bank (2005) describe China’s labor market development in greater detail.

and Yang, 2003). For instance, most rural migrants in cities are not able to obtain an urban residence legally and are treated as second class citizens. They have to pay much higher fees for accessing healthcare and schools than their urban counterparts.

Discriminatory treatments against rural migrant workers in terms of employment availability, job security and social services are commonplace, particularly in the formal sector.

*Capital market:*

In the planning era, banks were the dominant source of financing (World Bank, 2005). They primarily provided loans to the formal state enterprises within their locality. The central government exerted direct control on banks. Administrative means instead of market forces determined capital movement. The major role of banks was to ensure equity and support national development strategies.

Since the late 1970s, China has conducted a series of reforms in the banking sector. In 1983, the four state-owned commercial banks, the Bank of China, the Agricultural Bank of China, the Industrial and Commercial Bank of China, and the Construction Bank of China, were re-organized to be more market oriented. Aside from direct vertical control within the bank, local governments were granted more horizontal controls on the bank branches. As the economy developed rapidly, so was the increasing demand for credits. Not surprisingly, local governments tightened their control over local bank branches by blockading saving deposits from moving elsewhere. Many local governments forced banks in their jurisdiction to extend them credit, creating serious inflation in the early 1990s.



Since 1994, the central government has reasserted its control over the banks, separated bank branches from local governments, and set up regional banks. The purpose was to prompt capital mobility across provinces. However, there still exist loopholes in the system. In particular, local governments can use land as an important instrument to acquire loans to finance infrastructure development (World Bank, 2005). Once land is acquired from farmers for the public purpose, local governments and developers can then use the “state-owned” land as collateral to directly seek credit from the local branches of state banks. Land banking is one of the major drivers of the rapid growth in infrastructure investment in China (Zhang, 2006).

Despite the fact China has established the Shanghai Stock Exchange and Shenzhen Stock Exchange in December 1990, banks still play a dominant role in financial markets. In 2000, the banking system accounted for about two-thirds of financial transactions, while the bond and stock market constituted only five percent of financial flows (World Bank, 2005). There have been many abnormal phenomena in the development of the stock market (Lin, 2004). Most of the listed companies are state-owned enterprise and in general they perform worse than non-public enterprises (Chen, 2003). Many listed companies performed well in the first year and their performance subsequently deteriorated. The turn over rate has been much higher than other countries. Although in principle the stock markets should be conducive to capital mobility across regions and sectors, its scale has not been sufficiently significant yet.

Despite the various reforms in the financial sector, it is much harder for rural small businesses to obtain credit than the urban based, state-owned enterprises. The recent arrest and release of millionaire entrepreneur Sun Dawu for illegally accepting

deposits from local residents highlights the difficulties of many rural nonfarm enterprises in raising funds from state-owned banks and credit co-operatives (Economist, 2004). Aside from the anecdotal evidence, more research is needed to quantify whether the capital market has become more integrated or fragmented.

### **III. Changes in Factor Productivity**

Driven largely by institutional reforms, the Chinese economy has experienced a dramatic transformation over recent decades.<sup>4</sup> The share of agricultural GDP in total GDP declined from more than half in 1952 to less than 20 percent in 2001, while the share of the rural nonfarm sector increased from almost zero to more than a quarter. Coupled with these structural changes was a massive shift of labor from the lower productivity agricultural sector to the higher productivity nonfarm sector.

The data in Tables 1 and 2 on labor and capital productivities by region and sector, respectively, highlight the dramatic changes in factor markets and economic structure over the period 1978 to 2001.<sup>5</sup> Labor and capital productivities are calculated as the ratios of GDP to labor and capital; they are therefore measures of average not marginal productivity. There are large regional variations in labor productivity and which have widened over time. The northeast region had the highest labor productivity in 1978, but by 2001 it had fallen well behind the eastern region. The regional gap between the west and the rest of China has also worsened over time. Compared to labor productivity,

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<sup>4</sup> Lin (1992) provides a good reference for rural reforms; Theodore *et al.* (1994) cover the reforms of state owned enterprises; Lau, Qian, and Roland (2000) explain the rationale behind the successful price reform.

<sup>5</sup> The division of the four regions are as follows: (1) Heilongjiang, Liaoning, and Jilin provinces; (2) East: Municipalities of Beijing, Tianjin, and Shanghai; Hebei, Shandong, Jiangsu, Zhejiang, Hainan, Fujian, and Guangdong provinces; (3) Central: Shanxi, Henan, Jiangxi, Hunan, Hubei, Anhui; and (4) West: autonomous regions of Nei Mongol, Ningxia, Xinjiang, and Tibet, Sichuan, Shanxi, Gansu, Ningxia, Qinghai, Yunnan, Guangxi, and Guizhou provinces.

the regional disparities in capital productivity are much smaller and they have narrowed over time.

Table 2 shows that labor productivity grew the fastest in the rural nonfarm sector and slowest in the agricultural sector. Labor productivity began at a relatively low level in agriculture and the gap with other sectors is now much wider. The transfer of rural labor from farm to nonfarm activities will undoubtedly have enhanced overall economic growth and labor productivity. Regarding capital productivity, the rural nonfarm sector has again experienced the most rapid growth and by 2001 had achieved the highest level of all sectors. These disparities highlight capital market imperfections and the hunger for credit and capital that remains within rural areas for nonfarm activities. Broadening access to credit and investing more in the rural nonfarm sector would enhance economic efficiency and growth.

To put China's economic transformation in a broader international perspective, Table 3 compares the labor productivity of the industrial and service sectors relative to agriculture for China and several other Asian countries. The differences are stark. The labor productivity ratio of industry relative to agriculture is much higher in China than in other Asian countries. Moreover, while the ratios for other countries have generally remained stable or fallen, the ratio for China has risen substantially over the past 20 years. The same is true for the labor productivity ratio between the services and the agricultural sector. These extremely high ratios for China as well their increasing trends are symptomatic of major distortions in China's factor markets. There appears to be considerable potential for further economic growth simply by reallocating labor and capital among sectors.

#### IV. Trends in Product Market Integration

In this section, we update Young's analysis of the trends in product market integration to a more recent time period. Following Young (2000), we use the following sum of the squared deviations of the sectoral output shares of China's provinces from the group average to the degree of product market integration:

$$\text{Unweighted measure: } \sum_i \sum_j (S_{ij} - \bar{S}_j)^2 \quad (1)$$

$$\text{Weighed measure: } \sum_i \sum_j N * w_i (S_{ij} - \bar{S}_j)^2 \quad (2)$$

where  $S_{ij}$  denotes the share of sector  $j$  in province  $i$ 's output;  $S_j$  is the group average  $S_{ij}$  across provinces;  $w_i$  denotes the province's share of total GDP of  $N$  provinces

and  $\bar{S}_j = \sum w_i S_{ij}$ . In the absence of trade, a region would return to an autarky type of Robinson economy. Its production structures must be diversified to cope with the daily needs of food, clothes, shelter and so on. Therefore, without trade, the likelihood to have a specialized production structure is much smaller than with trade integration. It is expected that the more barriers on interregional trade, the more similar compositions of output across provinces, and the smaller value of the measures.

Figure 1 graphs the unweighted and weighted measures on the composition of output shares. Both measures provide similar results --- the composition of output has converged up to the early 1990s and diverged thereafter. The product market development follows a U-curve. An initial decline was followed by an upward trend that led by 2001 to a higher overall degree of regional specialization than in 1978. The convergence between 1978 and the early 1990s replicates Young's finding that China's product market became more fragmented. However, the upward trend of the measures

since the early 1990s indicates that the product markets have become more integrated since then. The evolving pattern of regional integration reported here for a four-sector disaggregation of GDP also echoes the findings of Bai *et al.* (2004) based on a 36-industry breakdown. The turning point coincided with the time when the central government took serious measures to remove interregional trade barriers. The initial market reforms may have brought about more distortions in the short run, but after the government responds to the crises by deepening reforms, the barriers in the product markets have been broken down over time.

Figure 2 presents the standard deviation of the logarithmic provincial GDPs per capita of farming, urban industry, urban service, and rural nonfarm. The variations of output per capita of urban industry and urban services were rather steady up to 1990 and then increased rapidly. The standard deviation of output per capita of farming increased by 81% from 1978 to 1994 and leveled off thereafter, while the spatial distribution of rural nonfarm activity has become increasingly uneven over the whole sample period. However, as Young (2000, page 1111) noted: “The imposition of trade barriers has clear implications for the interregional variation in output shares; it has no prediction regarding the variation in absolute output levels.” Nonetheless, the variations of output per capita in the four sectors offer useful information on the evolution of spatial distribution of economic activities.

## **V. Variations in Marginal Products of Capital and Labor**

Having shown recent trends in product market integration, we turn now to an analysis of possible fragmentation in the factor markets. From economic theory we know that

resource allocation is most efficient when the marginal products of each input are equalized across sectors and regions. By calculating inter-sectoral and inter-regional variations in the marginal product of each factor, we can uncover the degree of factor market distortions and hence the opportunities for achieving greater economic efficiency through improved factor allocation.<sup>6</sup>

We start by assuming that real value added (GDP) by sector follows a well-behaved, neoclassical production function:

$$Y_{it} = f_{it}(X_{i1t}, \dots, X_{ijt}, \dots, X_{imt}, T), \quad (3)$$

Where  $X_{ijt}$  is input  $j$  for sector  $i$  in year  $t$ . A thornier question is what functional form of the production function should be used. Considering both econometric estimation and theoretical consistency, we specify the following Cobb-Douglas functional form:<sup>7</sup>

$$\ln(Y_{it}) = A_{it} + \sum_j b_{ij} \ln(X_{ijt}), \quad (4)$$

where  $A_{it} = a_{i0} + a_{it}t + a_{it}t^2$ ;

or  $A_{it} = c_{i0} + \sum c_{it}D_t$ .

$D_t$  is a set of year dummy variables and  $c_{it}$  is the corresponding coefficients. The parameters in (4) corresponding to labor and capital are their elasticities. The estimated function for agriculture includes arable land as a separate input in addition to capital and labor. Because arable land areas do not change much and are highly location specific, we cannot use

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<sup>6</sup> Desai and Martin (1983) have estimated the efficiency loss due to resource misallocation in the former Soviet industry using a similar method. Syrquin (1988) carries out a similar exercise.

<sup>7</sup> It is well known that the Cobb-Douglas form has caveats. It assumes constant returns to scale and strong separability among inputs. To test the robustness of the results on the first caveat, Zhang and Tan (2004) present an alternative specification using varying coefficient model and the basic findings are the same. In the literature, several flexible functional forms have been put forwarded to address the separability problem. However, the limitations of the flexible functional forms have been increasingly recognized in the empirical literature (Chambers, 1988). For example, the multicollinearity problem inherent among the interactive terms and the fewer restrictions on the underlying production technology often lead to results which do not make much economic sense.

provincial dummies to control for potential heteroscedasticity problems. As a compromise, we add dummy variables for the eastern, central, and western regions to the production functions. To capture the technical change over time, in one specification, the time trend and its square are included; in the second specification, we add the fixed effects of year dummy variables.

To estimate production functions for each of our four sectors, we used data for 24 years (1978-2001) for 28 provinces, providing a panel of 672 observations. Tibet is excluded mainly because of lack of data. For data consistency, Hainan and Chongqing provinces are included in Guangdong and Sichuan provinces although they were separated in 1987 and 1997. A detailed description of the data used is provided in the Appendix.

The results of the estimated production functions for the four sectors under two different specifications are presented in Table 4.<sup>8</sup> Because agricultural output is measured as value-added, intermediate inputs such as fertilizer are excluded from output measures by definition. Including fertilizer and other intermediate inputs is more appropriate in estimating a production function for gross output. The results under the two different specifications are similar. The adjusted R<sup>2</sup>s are high for all the regressions, indicating a good fit. The year dummies in the first specifications are jointly significant in all the four regressions. Most coefficients for the time trend variables in the second specification are statistically significant.

The regression results for agriculture indicate that land still plays an important role in Chinese agricultural production. Among the regressions for all the sectors, the labor elasticity

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<sup>8</sup> The calculations of variations in marginal products of factors are rather robust to various specifications in large because marginal products are mainly determined by factor productivity across sectors rather than by the estimated elasticities. For simplicity, the inequality measures based on several alternative specifications are not reported here but are available upon request.

is larger than capital elasticity indicating that China's comparative advantage lies in labor intensive production.

Differences in estimated elasticities for the same input across sectors reflect differences in production technology, but on their own do not provide any indication of how efficiently resources are allocated. To obtain such insights it is necessary to calculate the marginal productivities of each factor. The marginal product of each factor is equal to the product of the estimated elasticity and corresponding partial factor productivity, as shown in:

$$\frac{\partial Y_{it}}{\partial X_{ijt}} = b_{ij} \frac{Y_{it}}{X_{ijt}}. \quad (5)$$

Figure 3 presents the marginal product of labor and capital by sector. The left figure shows that the marginal product of labor (MPL) in the urban areas is much higher than the farming and rural nonfarm sector, indicating huge potential gains of rural-to-urban labor migrations. In 1990, the MPLs in the urban industry and urban service sectors are about 19 and 13 times of agriculture. The results are comparable to the findings in Yang and Zhou (1997) that the ratios of MPL in the state sector to the agricultural sector was about 15 and 16 times between 1988 and 1992. The ratio of MPL in the rural nonfarm sector to farming sector in 1990 was 3.6 times in 1990, similar to the 3.7 times in 1992 reported by Wang (1997). In 1993, the Company Law was passed to encourage the privatization of town and private enterprises. As a result, the share of TVEs in gross industrial output value jumped from 20% to 25% while that of SOEs dropped from 43% to 34% in just two years from 1993 to 1995 (China Statistical Yearbook, p. 401). The large difference in MPLs suggests potential gains of labor mobility across sectors on aggregate output.



The figure on the right reports marginal product of capital (MPK) by sector. The MPK in the nonfarm sector has grown much faster than other sectors and by 2001 has the highest value among the four sectors. The MPKs in the farming and urban service sectors are the lowest.

Overall, the differences in marginal product of factors across the sectors are very large indeed. To quantify the degree of variation in the marginal products of inputs across the four sectors and 28 provinces, we use the Generalized Entropy (GE) inequality measure.<sup>9</sup> Because each province has four sectors, we have 2,688 observations in total. Figure 4 graphs the variations in marginal product of labor and marginal product of capital. The marginal product of labor has shown some convergence over the reform period, except in the last five years of our analysis (but which may be the result of some changes in the way the labor surveys were conducted during those years—see appendix).

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<sup>9</sup> Other measures are also used and the results are similar. Following Shorrocks (1980), the GE measure in marginal product of factor  $k$  can be written as:

$$GE(c) = \begin{cases} \sum_{i,j} w_{ij} \left\{ \left( \frac{M_{ijk}}{\mu} \right)^c - 1 \right\} & c \neq 0,1 \\ \sum_{i,j} w_{ij} \left( \frac{M_{ijk}}{\mu} \right) \log \left( \frac{M_{ijk}}{\mu} \right) & c = 1 \\ \sum_{i,j} w_{ij} \log \left( \frac{\mu}{M_{ijk}} \right) & c = 0 \end{cases}$$

where  $M_{ijk}$  denotes the marginal product of factor  $k$  for sector  $j$  in province  $i$ ,  $\mu$  is the arithmetic sample mean,  $w_{ij}$  is the share of GDP of sector  $j$  for province  $i$  in total GDP.  $GE(0)$  is the mean logarithmic deviation,  $GE(1)$  is the Theil index, and  $GE(2)$  equals half the square of the coefficient of variation. In principle, the GE measures are sensitive to various parts of the distribution depending on the selected value for  $c$ . We use the simplest form of this equation in which  $c = 0$ . When  $c=0$ , it is the mean logarithmic deviation and more sensitive to the bottom part of the distribution. The results for  $c=1$  and 2 are similar to the results when  $c=0$ . The reason to use GE is mainly due to its nice property of decomposing overall inequality into sub-components according to between and within groups.

On the other hand, the variation in the marginal product of capital was steady between 1978 and the early 1990s before rising substantially. The divergence in the marginal product of capital during the 1990s indicates greater fragmentation of capital markets. This finding is consistent with Boyrau-Debray and Wei (2003). The results suggest that, faced with growing competition in product and labor markets, the distortions may have shifted to the urban sectors such as banking, real estate and infrastructure projects. In this sense, our findings support Young's argument that partial reforms may lead to more distortions in the remaining economy.

As is well known, the GE family of inequality measures can be decomposed into the sum of within and between group components for any given partitioning of the population into mutually exclusive and exhaustive groups. Figure 4 graphs the between and within group (region and sector) components of the variation in the marginal products of capital and labor. The ratio of the between-group component to overall inequality is the so called polarization index (Kanbur and Zhang, 2001).<sup>10</sup> As more inter-sectoral variations in the marginal products of labor and capital contribute far more to overall inequality than inter-regional variation. In particular, the sectoral polarization index on the marginal product of capital has increased. This provides further evidence that as the reform process has deepened in the product market, the capital market has become more distorted.

These results indicate that there is room to improve China's overall economic efficiency simply by reallocating factors among sectors and regions. Our results suggest that reversing the entrenched urban-biased investment policies and undertaking in-depth reforms within the financial sector would not only improve economic efficiency the most

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<sup>10</sup> A polarization index is defined as the ratio of between-inequality to overall inequality.

but also promote greater equity as the lion's share of the poor live and work in rural areas.

## **VI. Policy Simulations**

How large are the potential gains from improving factor market performance? To answer this question, we use the estimated production functions from the first specification in Table 4 to calculate the potential increases in national GDP resulting from simulated factor reallocations.<sup>11</sup> Appendix II reports the underlying models and baseline information. As the first step, we calibrate the models to obtain the constant terms in the production functions of the four sectors based on the estimated elasticities and the labor, capital and GDP information in 2001. In so doing, the production functions will predict exact results in 2001. Next, we use the calibrated models in the four sectors to conduct hypothetical policy simulations.

Considering the low labor productivity in the agricultural sector, our first experiment is to move additional labor out of the agricultural sector. Using 2001 as a baseline, we evaluate three scenarios: moving 1%, 5%, and 10% of the agricultural labor force out of agriculture and distributing it equally among the other three sectors. As shown in Table 5, even reallocating just one percent of the agricultural labor force could increase national GDP by 0.9%. If the share of labor reallocated is 5% and 10%, then national GDP would increase by 4.4% and 8.8%, respectively. The results are supported by an independent early study by Yang and Zhou (1999). They reported a gain of aggregate output by 0.7, 3.1, and 5.8

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<sup>11</sup>Policy simulations just point out the potential gains from reform. However, questions remain on the mapping from simulations to actual reforms. In addition, there are no standard errors. Therefore the precision cannot be assessed. It is likely that the simulations results depend upon the underlying functional forms as well as the accuracy of the data. We are reassured in that simulations (Zhang and Tan, 2004) based upon a varying coefficient model have led to similar findings. In Table 5, we also check the robustness of the results by undertaking similar simulations with a base line of higher labor productivity in the agriculture sector.

percentage based on the same three hypothetical percentages of labor transfers using 1992 as a baseline.

In the second experiment, we simulate a change in the current urban biased policies by shifting capital from cities to rural areas while keeping total capital constant. Reallocating 1%, 5%, and 10% of urban capital, respectively, to rural areas leads to gains in national GDP of 0.5%, 2.1%, and 3.9%, respectively.

In the third experiment, we assume that the government allocates all the additional investment in the rural areas and equally distributes them between the agricultural and rural nonfarm sectors. By assuming a discount rate of four percent and using national fixed asset price index, we convert the investment into capital stock.<sup>12</sup> Additional 10 billion Yuan of investment in rural areas yields an increase in national GDP of 0.03%, equivalent to 2.9 billion 2001 Yuan. Considering that the farm and rural nonfarm sectors are labor intensive, this scenario would likely also help raise the incomes of many of the poorest people in China. When the size of investment increases to 50 and 100 billion, national GDP increases by 0.15% and 0.29%, respectively, with an increase in national GDP of 14.3 and 28.4 billion Yuan. Because the capital will not vanish immediately, the long term impact is much higher. If assuming a four percent discount rate, the annual internal rate of returns to the investment in rural areas is over 20%.

In the next experiment, we consider a counterfactual scenario in which all the additional investment is distributed evenly in the two urban sectors. Under the three scenarios of investment of 10, 50, and 100 billion Yuan, national GDP increases by 0.7, 3.6, and 7.2

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<sup>12</sup> In the period of 1991-2001, the national fixed asset price index is available from the China Statistical Yearbook. However, it was published prior to 1991. Therefore, the national GDP deflator is used a proxy for the period of 1978 to 1991. For the whole period, the calculated capital price index is 3.53, compared to the published GDP deflator of 3.33.

billion Yuan. As shown in the last column of the table, the rate of returns to rural investment is about four times of that to urban investment.

As the National Statistical Bureau has adjusted the national GDP figures based on the first economic census, we check the robustness of the results to the adjustment. We recalibrate the constant terms in the four production functions as shown in Appendix II using the adjusted 2001 GDP data by sector and undertake the same set of simulations. The figures in the parentheses are the simulation results based on adjusted national GDP data. The basic results are similar to those based on original GDP figures.

The policy simulation highlights the potential economic gains from reallocating factors from low to high productivity sectors. Removing barriers to labor movement, reversing the urban bias in government investment policies, and deepening the reforms would significantly enhance overall economic growth. In addition, these policy changes could also bring about favorable distributional effects by reducing regional and sectoral inequalities. Since large inequalities are a potential source of social conflict and instability, the far-reaching social impact of these policies could be equally important.

## **VII. Conclusions and Policy Implications**

The aim of China's reforms are to reduce economic distortions and improve efficiency. This paper examines the changing patterns of distortions during the reform process, how have past policies contributed to these distortions, and the estimated cost to the economy in terms of lower output and greater regional and sectoral disparity. The empirical findings of this paper indicate that product markets in China have become more integrated despite a short duration of increasing fragmentation in the early reform period. The labor

markets also have become increasingly integrated due to a large shift in labor force from the agricultural sector to nonfarm sectors and less control on migration. However, intersectoral differences in marginal products of capital have grown during the reform period.

Local governments who have been collecting rents in a partially reformed system are interim winners of reform. In the short run, distortions might beget more distortions as Young has shown. However, in response to the increasing fragmentation in product markets, the government has undertaken measures to remove local protections. Consequently, there are less and less rents to be collected in the product and labor market over time and the distortions have been increasingly squeezed into the financial and land markets (including infrastructure and real estate). For local governments, these are the two last bastions for rents collection, as well as breeding ground for corruption. If just looking at the product market, the market might have become distorted in the short run. However, as the government responded to the problems with deepening reforms, the market has become integrated. However, when considering all the sectors, the results seem to support Young's argument that as some distortions in a partially reformed economy are removed, new distortions may be added. The key is whether the government can continue to conduct reforms to squeeze out the distortions in the capital market as those from the product and labor markets have been squeezed out before.

The continuing large differences in both labor and capital productivity across sectors suggests that China still has great potential for further efficiency gains through continued structural change. To realize this potential, however, many restrictions on factor movement, in particular the inter-sectoral capital movement needs to be removed. Efficient capital markets that can funnel new investment to sectors with higher returns still need to be

developed. The particularly higher capital returns in the rural nonfarm sector suggest that more aggressive government policies should be sought to increase investment there, or at least not hinder their movement. Such policies will not only improve overall economic performance, but also narrow the development gap and inequality between the rural and urban sectors. Similarly, the government should also encourage labor movement from agriculture to rural enterprises, urban industry, and service sectors as labor productivity in these sectors continues to be much higher than in the agriculture sector.

While the empirical estimates and policy simulations can help to provide rough order of magnitude on the nature of the structural problems, policy recommendations on gradual elimination of these distortions need to take into account complex issues of political feasibility, sequencing, implementation problems, downside risks of policy measures, nature of vested interests and how to overcome them, the need to minimize negative side effects as well as the estimates on efficiency gains, the effect on equity, regional disparity and rural-urban inequality. More research is needed to understand the political economy dimensions that have times seriously constrained the pace of reform. Nonetheless, simulations of alternative policy proposals and their estimated effects could act as useful inputs to policy making.

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## APPENDIX I DATA

### A. GDP

Both nominal GDP and real GDP growth indices for various sectors from 1978 to 1995 are available from NBS's *The Gross Domestic Product of China* (NBS, 1997a). The data sources and method of constructing national GDP estimates were published by the State Statistical Bureau (NBS, 1997b). This publication indicates that the NBS has used the U.N. standard SNA (system of national accounts) definitions to estimate GDP for 29 provinces by three economic sectors (primary, secondary, and tertiary) in Mainland China for the period 1952-95. Since 1995, the *China Statistical Yearbook* has published GDP data every year for each province by the same three sectors. Both nominal and real growth rates are available from NBS official publications.

We use four sectors in our analysis: agriculture, urban industry, urban services, and rural enterprises. The agriculture sector is equivalent to the primary sector used by NBS. The following procedures were used to construct GDP for the other three sectors. Until 1996, China published annual gross production values for rural industry and services. Since 1996, they began to publish value added figures in *China Township and Village Enterprise Statistical Yearbook* (NBS). The definition of value added is GDP originating in the sector. The Ministry of Agriculture published data on both gross production value and value added for rural industry (including construction) and services in *China's Agricultural Yearbook, 1996*. The data on nominal value added for rural industry and services prior to 1995 were estimated using the growth rate of gross production value and 1995 value-added figures, assuming no change in the ratio of value added to gross production value.

GDP for rural industry was subtracted from GDP for industry as a whole (or the secondary sector as classified by NBS) to obtain GDP for urban industry. Similarly, GDP for rural services was subtracted from service sector GDP as a whole (or the tertiary sector as classified by NBS) to obtain GDP for the urban service sector. GDP for rural enterprises is the sum of GDP for rural industry and rural services.

Based on the First National Economic Census, the National Statistical Bureau adjusted the GDP figures prior to 2004. However, only the data at the national level for three sectors have been released. Without the data at the provincial level, it is impossible to reestimate the production functions. The adjusted figures as shown in the NBS' website do reveal a few interesting patterns.

First, the discrepancy between the old and new figures was initially small and has been increasing over time. In 1993, the differences for the agriculture, industry and service sectors are only 0.07%, 0.16%, and 5.90%, respectively. By 2001, the gaps increase to 0.76%, 1.73%, and 39.15%. Because our estimations use a panel data set from 1978 to 2001, for most of the time period, the two series are close. Therefore, the adjustment of data for a few years will not be very likely to change the results. In addition, the year dummy variables have been included in sectoral production functions to help reduce the systematic measurement errors.

Second, the service sector has been underreported much more than other sectors. Most of the discrepancies for the national GDP are a result of underestimation in service GDP. Third, the regional discrepancy is much smaller than the sectoral discrepancy. For 2004, the share of adjusted GDP by the East is 55.4%, 1.2% higher than the unadjusted one, while, the central, western, and northwestern regions have declined by 0.8%, 0.2%, and

0.6%, respectively. In other words, the adjusted figures indicate a higher regional inequality than before. Because the regional dummies have been included in the regressions, some of the systematic measures at the regional level can be eliminated.

The implicit GDP deflators by province for the three sectors are estimated by dividing nominal GDP by real GDP. These deflators are then used to deflate nominal GDP for rural industry and services to obtain their GDP in real terms.

## B. LABOR

Labor input data for the primary, secondary, and tertiary sectors at the provincial level after 1989 can be found in NBS's *Statistical Yearbooks* (various issues), while provincial labor data prior to 1989 are available in NBS (1990). Labor is measured in stock terms as the number of persons at the end of each year. For rural industry and services, prior to 1984, labor input data at the township and village level but not at the individual household level are available in NBS's *Rural Statistical Yearbooks*. The omission of individual-household, non-farm employment data will not cause serious problems, as the share of this category in rural employment was minimal prior to 1984. Urban industry labor is estimated by subtracting rural industry labor from total industry labor, and urban service labor is similarly estimated as total service labor net of rural service labor. However, since 1997, the discrepancy between the labor data at the national level by sector and the sum of the data at the province level by sector has shown a large increase. Private conversations with officials in the China Statistical Bureau revealed that the national labor force data are more accurate because they are generated from either census or population sample surveys. The provincial labor force data are reported from lower level governments. When labor becomes more

mobile, the difference between the two measures gets larger. In this paper, we adjust labor force data by sector for each province based on the values in 1996 and the annual growth rates of national labor force by sector. The measured trend in capital market integration still holds after this adjustment of the labor force data. However, the variation in the marginal product of labor increases slightly after 1997 when using the unadjusted rather than the adjusted labor force data.

### C. CAPITAL STOCK

It is a difficult task to estimate capital stocks by sector and by province. Chow (1993) estimates China's capital stock for five sectors from 1952 to 1988. Because his data series are at the national level, we cannot use them to estimate capital stocks at the provincial level directly. In addition, his five sectors are different from our four sectors.

Li (2003) constructs capital stocks by province from 1984 to 1998 using similar methods to Chow's. The biggest challenge he faced was to construct the initial capital stock values in 1984. He first derived the share of provincial real gross investment and applied it to Chow's national capital to construct the initial provincial capital stock. An implicit assumption made here is that the provincial share of real gross investment equals the provincial capital ratio. However, his capital stock is not sector specific and cannot be used directly in our analysis. So we had to seek alternative approaches.

Capital stocks for the four sectors are calculated from data on gross capital formation and annual fixed asset investment. For the three sectors classified by NBS, the data on gross capital formation by province after 1978 was published by NBS (1997). Gross capital formation is defined as the value of fixed assets and inventory acquired minus the value of

fixed assets and inventory disposed. To construct a capital stock series from data on capital formation, we used the following procedure. Define the capital stock in time  $t$  as the stock in time  $t-1$  plus investment minus depreciation:

$$K_t = I_t + (1 - \delta)K_{t-1} \quad (1)$$

Where  $K_t$  is the capital stock in year  $t$ ,  $I_t$  is gross capital formation in year  $t$ , and  $\delta$  is the depreciation rate. *China Statistical Yearbook* (NBS, 1995) reports the depreciation rate of the fixed assets of state owned enterprises for industry, railway, communications, commerce, and grain for the years 1952 to 1992. We use the rates for grain and commerce for agriculture and services, respectively. Since 1992, NBS has ceased to report official depreciation rates. For the years after 1992, we used the 1992 depreciation rates.

To obtain initial values for the capital stocks, we used a similar procedure to Kohli (1982). That is, we assume that prior to 1978, real investment grew at a steady rate ( $r$ ) equal to the rate of growth of real GDP from 1952 to 1977. Thus,

$$K_{1978} = \frac{I_{1978}}{(\delta + r)} \quad (2)$$

This approach ensures that the 1978 values of the capital stocks are independent of the 1978-95 data used in our analysis. Moreover, given the relatively small capital stocks in 1978 and the high levels of investment, the estimates for later years are not sensitive to the 1978 benchmark values of the capital stocks.

Estimates of capital stocks for rural industry and services are constructed using the annual fixed asset investments by province from 1978 to 1995, which are available in the annual *China Statistical Yearbooks* and the *China Fixed Asset Investment Statistical Materials, 1950-95*. Initial values are calculated using equation (4), but the growth rate of

real investment prior to 1978 is assumed to be four percent. Again, the initial capital stocks are low, so the estimated series are not sensitive to the benchmark starting values. The capital stocks data from 1996 to 2001 are obtained directly from NBS.

The capital stock for rural industry was subtracted from that of total industry (or secondary industry as classified by NBS) to obtain the capital stock for the urban industry sector. Similarly, the capital stock for rural services was subtracted from the stock for the aggregate services sector (or tertiary sector as classified by NBS) to obtain the capital stock for the urban services sector. Finally, the capital stock for rural enterprises was obtained as the sum of the capital stocks for both rural industry and services.

Prior to constructing capital stocks for each sector, annual data on capital formation and fixed asset investment was deflated by a capital investment deflator. The NBS began to publish provincial price indices for fixed asset investment in 1987. Prior to 1987, we use the national price index of construction materials to proxy the capital investment deflator.

It is worth noting that, when aggregating provincial capital stocks to the national level and comparing the aggregate with Chow's series for the common period of 1978-1988, we find the two series share a very similar trend. We also compare our provincial capital stocks with Li's. As shown in Figure 4, the two data series are closely correlated to each other except in a few provinces. One outlier is Liaoning Province. Li (2003) reports that Liaoning Province has the largest capital stock with a value of 2,918 hundred million Yuan 1984, compared to 1,767 and 1,134 hundred million Yuan in Jiangsu and Guangdong Provinces. However, the official source (NBS, 1997a) shows that the fixed capital formation data for the three provinces are 62.33, 77.96, and 142.52 hundred



million Yuan, respectively. Our capital stocks for the three provinces are 744.78, 1077.76, and 843.08 hundred million Yuan, respectively. It seems our series for Liaoning Province is more consistent with the capital formation data. Because Li's paper does not include capital data by sector, we cannot further compare our sectoral capital stocks with his. Despite the difference of the three capital stocks series, they are complementary to each other. When they do overlap, the data series are quite consistent.

## APPENDIX II THE UNDERLYING MODEL FOR POLICY SIMULATION

The models in the four following sectors are as follows:

$$\text{Agriculture: } Y_1 = 0.140 * LAND^{0.386} K_1^{0.430} L_1^{0.111};$$

$$\text{Urban industry: } Y_2 = 0.628 * K_2^{0.852} L_2^{0.256};$$

$$\text{Urban service: } Y_3 = 0.858 * K_3^{0.708} L_3^{0.263};$$

$$\text{Rural nonfarm farm: } Y_4 = 1.591 * K_4^{0.601} L_4^{0.364}.$$

The constant terms in the four models are calibrated based on information in 2001 as shown in Table B. The nominal national GDP in 2001 is 9,572.8 billion Yuan. The national GDP is 3,764.2 billion 1978 Yuan, total labor force is 630.5 million, and total capital stock is 7,183.8 billion 1978 Yuan.

Table B The Baseline of Simulations

	Agriculture	Urban industry	Urban service	Rural nonfarm	Total
Labor (million)	3,297	551	879	1,578	6,305
Capital (billion 1978 Yuan)	581	2,532	3,410	661	7,184
GDP (billion 1978 Yuan)	320	1,293	832	1,302	3,746

Table 1 Labor and Capital Productivity by Region

Productivity	China	East	Central	Western	Northeast
<i>Labor Productivity</i>					
1978	868	1,073	707	619	1,672
1984	1,260	1,655	1,046	853	2,072
1990	1,841	2,578	1,471	1,201	2,912
1995	3,356	5,429	2,567	1,842	4,409
2001	5,949	9,694	4,468	3,223	8,063
Growth rate (%)	8.7	10.0	8.3	7.4	7.1
<i>Capital Productivity</i>					
1978	36	41	38	25	45
1984	42	45	43	32	47
1990	41	42	42	36	43
1995	53	56	55	43	51
2001	52	52	54	47	57
Growth rate (%)	1.6	1.0	1.5	2.7	1.1

Note: The unit of labor productivity is 1978 constant Yuan; the unit of capital productivity is 1978 constant Yuan per 100 Yuan capital stock. The figures are calculated by authors based on the data of 28 provinces, which are slightly different from those based on national data.

Table 2 Labor and Capital Productivity by Sector

Productivity	China	Agriculture	Urban industry	Urban service	Rural nonfarm
<i>Labor Productivity</i>					
1978	868	346	3,245	1,949	623
1984	1,260	509	3,783	2,883	856
1990	1,841	585	5,713	4,615	1,510
1995	3,356	761	8,597	6,275	4,917
2001	5,949	987	23,074	9,573	8,193
Growth rate (%)	8.7	4.7	8.9	7.2	11.9
<i>Capital Productivity</i>					
1978	36	52	46	19	22
1984	42	74	45	26	30
1990	41	78	38	30	59
1995	53	74	45	33	121
2001	52	57	51	25	192
Growth rate (%)	1.6	0.4	0.5	1.1	9.8

Note: The unit of labor productivity is 1978 constant Yuan; the unit of capital productivity is 1978 constant Yuan per 100 Yuan capital stock. The figures are calculated based on provincial data by authors.

Table 3. Trends in the Labor Productivity of Industry and the Service Sector as a Ratio of Agricultural Labor Productivity, China and Other Selected Asian Countries

Year	IN/AG	SE/AG	Year	IN/AG	SE/AG
China			Indonesia		
1978	7.0	4.9			
1988	4.6	3.8	1993	7.2	3.6
1995	5.4	3.2	1998	7.0	2.8
2001	7.5	4.0	2002	6.5	3.0
Philippines			Malaysia		
1989	4.4	2.1	1987	2.7	1.5
1995	4.5	2.1	1995	2.1	1.8
2002	4.2	1.8	2001	2.5	1.9
Korea			Taiwan		
			1981	2.4	3.9
1987	2.5	2.6	1988	2.6	3.9
1995	2.4	1.9	1995	2.9	4.7
2002	3.1	1.7	2002	3.0	4.5
Japan			US		
1990	3.2	3.0	1987	1.5	1.6
1995	3.1	3.4	1995	1.8	1.7
2001	3.3	3.4	2001	1.4	1.3

Note: AG: Agriculture; IN: Industry; SE: Services

Source: World Development Indicators, World Bank.

Table 4 Estimated Production Functions by Sector, China

	Specification I				Specification II			
	Agriculture	Urban industry	Urban service	Rural nonfarm	Agriculture	Urban industry	Urban service	Rural nonfarm
Labor	0.430** (0.026)	0.852** (0.037)	0.708** (0.036)	0.601** (0.026)	0.428** (0.026)	0.819** (0.037)	0.694** (0.036)	0.565** (0.026)
Capital	0.111** (0.018)	0.256** (0.036)	0.263** (0.029)	0.364** (0.031)	0.114** (0.018)	0.287** (0.038)	0.273** (0.029)	0.406** (0.032)
Land	0.386** (0.031)				0.386** (0.031)			
Eastern	0.081** (0.039)	0.376** (0.039)	0.373** (0.051)	-0.325** (0.056)	0.079** (0.039)	0.373** (0.040)	0.363** (0.051)	-0.330** (0.058)
Central	-0.203** (0.033)	-0.152** (0.040)	0.107** (0.051)	-0.391** (0.055)	-0.203** (0.032)	-0.156** (0.040)	0.105** (0.043)	-0.378** (0.058)
Western	-0.521** (0.035)	0.044 (0.047)	0.018 (0.048)	-0.818** (0.057)	-0.522** (0.035)	0.030 (0.047)	0.010 (0.048)	-0.791** (0.059)
Year dummy	Yes**	Yes**	Yes**	Yes**				
T					0.071** (0.005)	0.110 (0.659)	0.088** (0.007)	0.037** (0.009)
T <sup>2</sup> /100					0.112** (0.020)	0.245** (0.026)	-0.171** (0.029)	0.323** (0.037)
Adjusted R <sup>2</sup>	0.951	0.928	0.917	0.958	0.951	0.928	0.917	0.954

Note: Figures in parenthesis are standard errors. The symbols \* and \*\* indicate 5% and 10% significant levels, respectively.

Table 5 Impact of Alternative Policy Simulations on China's GDP

Move x% of the agricultural labor force out of farming	1%	5%	10%
Change in GDP (%)	0.89	4.42	8.77
	(0.89)	(4.22)	(8.78)
Reallocate x% investment from cities to rural areas	1%	5%	10%
Change in GDP (%)	0.46	2.13	3.90
	(0.41)	(1.90)	(3.45)
Add x billion Yuan of investment in rural areas	10	50	100
Change in GDP over 2001 (%)	0.03	0.15	0.29
	(0.03)	(0.14)	(0.27)
Change in GDP over 2001 (Billion Yuan)	3.66	18.26	32.31
Add x billion Yuan of investment in urban areas	10	50	100
Change in GDP over 2001 (%)	0.01	0.04	0.07
	(0.01)	(0.04)	(0.08)
Change in GDP over 2001 (Billion Yuan)	0.92	4.58	9.16
	(1.03)	(5.16)	(10.30)
	3.99	3.98	3.97
The ratio of returns to investment in rural areas to urban areas	(3.60)	(3.59)	(3.58)

Note: Based on the first National Economic Census, the National Bureau of Statistics adjusted the national GDP figures up to 2004. To check the robustness of the results, we recalibrate the constant terms in the four production functions as shown in Appendix II using the adjusted 2001 GDP data by sector and undertake the same set of simulations. The figures in the parentheses are the simulation results based on adjusted national GDP data.





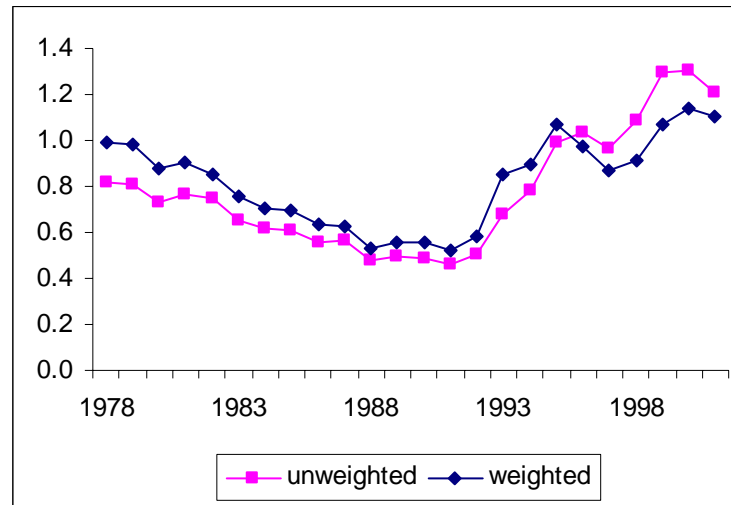


Figure 1 Convergence in the Composition of Output

Note: The measures are the weighted and unweighted sum of squared deviations of the sectoral output shares of China's different provinces from the national average.

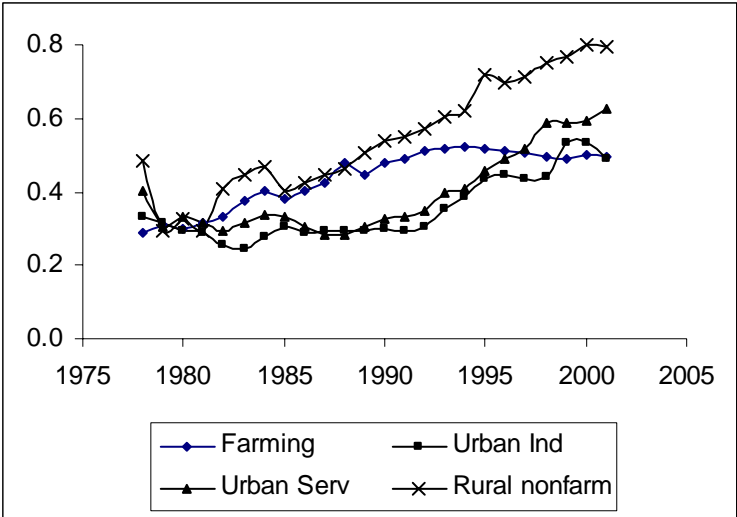


Figure 2 Standard Deviation of ln(GDP per capita)

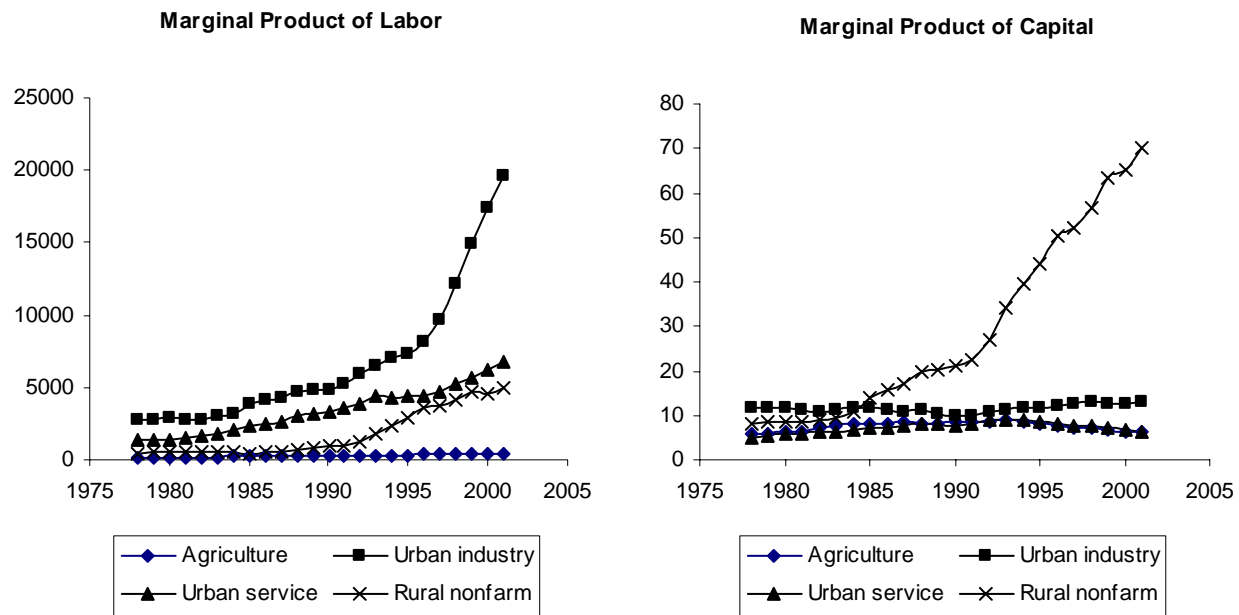


Figure 3 Marginal Products of Labor and Capital

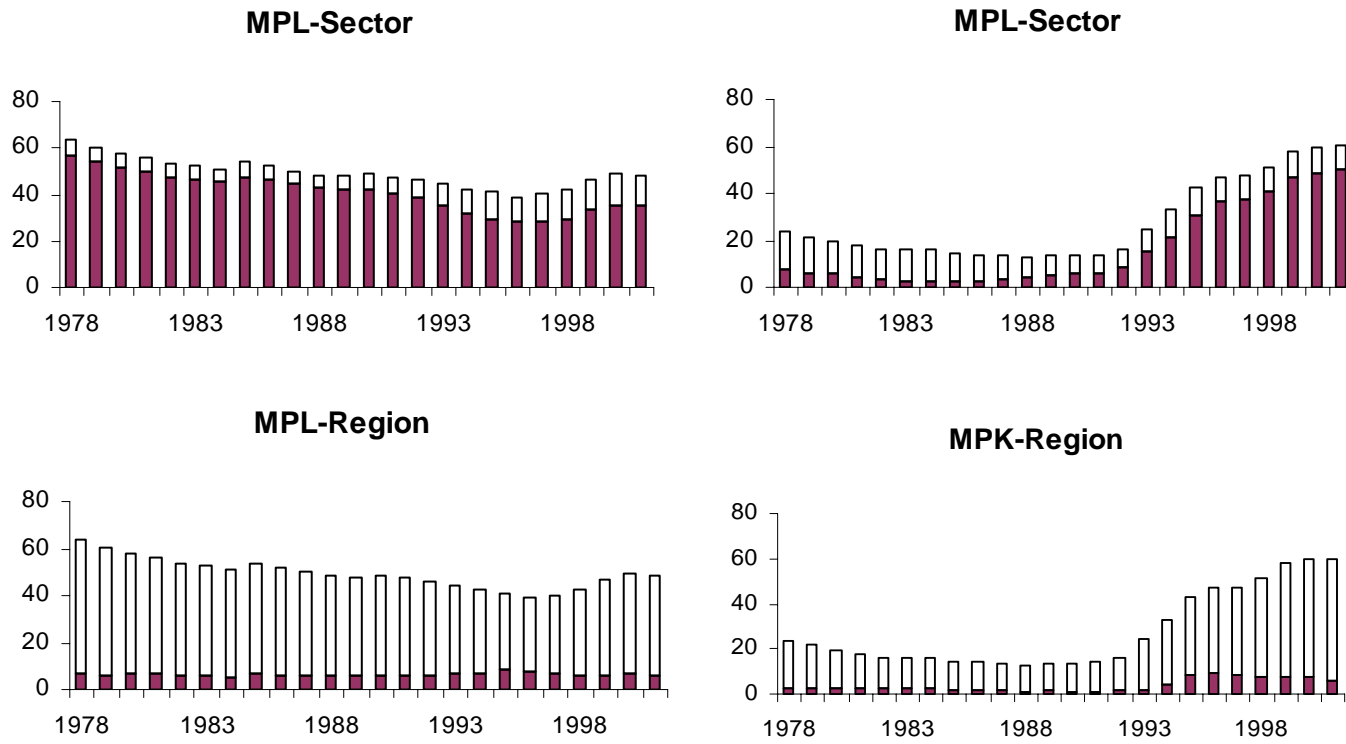


Figure 4 Variations in Marginal Product of Labor and Capital

Note: The blank bars stand for the variation within sector or region, while the sold bars represent the between components.

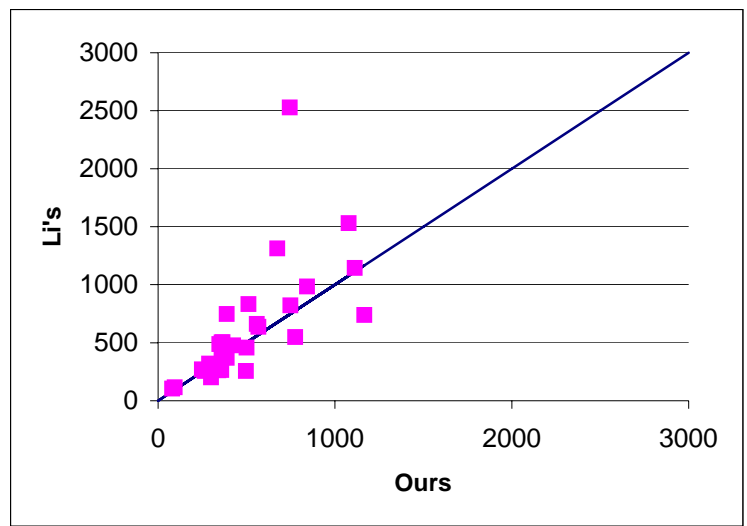


Figure 5 Comparison of two different capital stocks by province in 1984

Note: The unit is hundred million Yuan.