Blunting the Razor's Edge: Regional Development in Reform China

Yang Du
Institute of Population and Labor Economics,
Chinese Academy of Social Sciences

Albert Park (alpark@umich.edu)
Department of Economics, University of Michigan

Preliminary: please do not cite without permission

Abstract

This paper takes a critical view of Alwyn Young's controversial finding that China's internal markets became less rather than more integrated during the reform period (Young, 2000). Young's paper presents three main empirical findings: the structure of economic output across provinces converged until 1993, regional price dispersion did not fall over time as would be expected with more integrated markets, and labor allocation in agriculture did not shift in line with comparative advantage. We show that once one controls for expected changes in economic structure associated with growth in each province, regional specialization actually increases beginning in early 1980s. We argue that increasing price dispersion is an inappropriate measure of market integration, because it may reflect greater transport congestion when there is greater internal trade and because prices may have initially had low variance due to pan-territorial government pricing policies. Finally, we show that Young's analysis of marginal returns to agricultural labor is flawed because inaccurate and overly aggregated data. We conclude that Young's analysis provides little empirical support that Chinese markets became less integrated during the reform period.

1.Introduction

Recently, there has been a spate of papers addressing the question of China's internal market integration during the period of economic reform. Young (2000) raised the provocative hypothesis that China's markets had become less rather than more integrated over time, at least until the early 1990s. In a series of papers, Poncet has used different methods and data to argue that the trend toward less integrated markets extended into the late 1990s (Batiss and Poncet, 2003; Poncet, 2002, 2003a, 2003b). Others have countered this view, presenting evidence of greater internal trade and market integration (Naughton, 1999; Xu, 2002; Bai et al., 2003).

In this paper, we take a critical view of Young's study, which presents three main empirical findings: the structure of economic output across provinces converged until 1993, regional price dispersion did not fall over time as would be expected with more integrated markets, and labor allocation in agriculture did not shift in line with comparative advantage. We offer independent assessments of each of these findings, and conclude that Young's analysis provides little empirical support that Chinese markets became less integrated during the reform period. Some of the insights into the problems with Young's analysis help inform the larger debate about China's internal market integration.

2. Convergence in Economic Structure

Young first presents evidence the provincial economic structure, measured by sectoral output shares, converged during most of the reform period. In other words, the production structure of different provinces looked increasingly similar over time. He divides provincial and national GDP into the shares from the primary (agriculture), secondary (mining, manufacturing, construction, and utilities), and tertiary (services) sectors.[1] A regional specialization index (*S*) is then calculated for each year:

$$S = \frac{1}{nJ}\sum_{i=1}^{n}\sum_{j=1}^{J}\left|S_{ij} - S_{ic}\right| \qquad (1)$$

Here, S_{ij} is the share of province j's output that comes from sector i, S_{ic} is the national output share for sector i, and n and J are the number of sectors and provinces, respectively. This measure is thus the average deviation of provincial sectoral output shares from national output shares across all sectors and provinces. Figure 1 reproduces Young's results, and extends the results to 1998. There is a systematic decline in regional specialization dating from the socialist period and extending well into the reform period, at least to 1993.

One of the concerns about interpreting the results in Figure 1 is that patterns of regional specialization and diversification may depend upon factors other than market integration. A simple thought experiment is to think of unchanging economies with different endowments and common preferences and technology that first cannot trade and then are allowed to trade. In this special case, trade theory strongly predicts greater

[1] For periods starting from perform years, he divides national income into five sectors (agriculture, industry, construction, transport, and commerce).

regional specialization with freer trade. However, in the real world many things are changing. First, socialism cannot be equated with a no-trade regime, since planners could decide to have regions specialize in production of specific goods. It is thus unclear what the starting point was relative to a free trade system, notwithstanding China's large investments in industry in interior provinces during the socialist period. Second, regional specialization can depend on changes in technology that affect scale economies, as hypothesized by Kim (1995), who found rising, then falling regional specialization in U.S. industries from the late 19th to mid-20th centuries. As Young notes, U.S. states have exhibited falling regional specialization over time in recent decades despite very open markets, which should lead to caution in interpreting similar evidence for China. Third, stages of diversification are associated with different levels of economic development (Imbs and Wacziarg, 2003). As countries develop, they first diversify, or spread economic activity more equally across sectors, but then later specialize again. Provinces in China are all sufficiently poor that they should be in the diversification state, which is likely to reduce measures of regional specialization.

To see how this latter problem may be particular important for a country like China, where growth was so rapid, we make an adjustment to Young's specialization index to account for expected changes in economic structure in each province associated with the province's level of economic development. We first regress provincial sectoral shares on the log of GDP per capita, allowing for provincial fixed effects to control for unobserved factors that might systematically affect production structure in each province:

$$S_{ijt} = \alpha_i + \beta_i GDPPC_{jt} + \sum_{j=2}^{J} \delta_{ij} + \varepsilon_{ijt} \quad (2)$$

GDPPC represents GDP per capita. Based on the parameter estimates, we then can calculate predicted sectoral shares, $\hat{S}_{ijt}$, for each sector in each province in each year. Instead of examining the difference between actual provincial sectoral shares and actual national sectoral shares, we compare the difference between actual provincial sectoral shares and predicted provincial sectoral shares in each year:

$$S^* = \frac{1}{nJ} \sum_{i=1}^{n} \sum_{j=1}^{J} \left| S_{ij} - \hat{S}_{ij} \right| \quad (3)$$

This measure examines the extent to which the provinces output deviates from that which would be expected given the provinces level of development and unobservable fixed factors.

Summing over provinces and sectors as in Young's measure, we calculate a regional specialization index adjusted in this way, and present the results in Figure 2. Trends in specialization over time differ quite sharply from Young's results, suggesting that while regional specialization decreased during the socialist period, it increased substantially during the reform period, beginning in the early 1980s. Similar differences are found in recalculating other measures presented by Young, such as the sum of squared deviations.[2]

One of the problems with our adjusted regional specialization index is that it implicitly takes the level of GDP per capita as exogenously given, even though GDP is determined by many things going on in the province, including trade. However, to the extent that the level of development reflects a particular demand structure, even across provinces with varying levels of trade, controlling for this effects would seem to be of first order importance.

3. Regional Price Integration

Young next presents trends in the regional variance of prices, finding that there is no clear pattern of rising or falling price dispersion for industrial inputs or agricultural commodities during the period from 1987 to 1999. He argues that this is inconsistent with expected falling regional price dispersion in more integrated markets.

Here, again, there are a number of reasons to question such a simple interpretation of the observed changes in price dispersion. First, reiterating an earlier argument, the starting point for regional price differences was not a no-trade market equilibrium, but rather a system of planned, often pan-territorial prices that often made inadequate allowances for regional cost differences. Especially for industrial materials, and to some extent for agricultural commodities, in the early reform period, measured prices likely reflected planning influences, even if reported as market prices. For this reason, we need to know much more about how such price data were collected. Second, in China, there were periods of substantial transport bottlenecks, in particular when the demand for railcar space far exceeded supply in the early 1990s. This could have increased transport costs and price dispersion without any explicit protectionist policies, reflecting greater rather than less inter-regional trade activity. To some extent, this was also a planning problem, since it reflected inadequate pricing reforms in the transport sector.

In any case, Young points out himself that the lack of falling price dispersion is not necessarily evidence that markets were not functioning. In fact, for agricultural commodities, there is evidence that markets deepened even as measured transaction costs fluctuated, and that trade restrictions were unlikely to explain uneven market performance over time (Park et al., 2002). One must understand deeply the policy and institutional context of specific markets to make clear inferences about the reasons for changing price relations over time. Here, Young's results scratch the surface, but lack import.

4. Labor Productivity, Agriculture, and the Weather

The final part of Young's analysis examines changes in the regional variation in labor productivity. First, Young presents evidence that the variation in relative labor allocations to the primary and secondary sectors and in relative labor productivities of the two sectors increased rather than declined, as would be expected if the fall in regional

---

[2] Imbs and Wacziarg (2003) also find a U-shaped pattern of diversification and level of development even for sectors defined at low levels of aggregation, and so it will be of interest to examine trends in similarly adjusted regional specialization indices for more disaggregated sectoral analyses. This is next on our research agenda. We also intend to test the robustness of our results to more flexible specifications of the relationship between sectoral shares and GDP per capita (2).

specialization were due to convergence in the patterns of comparative advantage. Further, the relative labor allocation and relative labor productivities appear to be negatively correlated. Second, Young shows that in agriculture, grain yields and labor per hectare were positively correlated in 1978 across provinces as expected, but became unrelated in 1997, so that low yield regions saw less decrease in labor per hectare than high yield regions. Further, through regression analysis, Young finds that labor and agricultural machinery have no significant impact on yields, and that provinces with better weather withdrew inputs from agriculture over time.

One major weakness of Young's analysis of labor allocation and labor productivity is his use of provincial data from China's statistical yearbooks on aggregate stocks of labor in the primary and secondary sectors. These data are well known for over-estimating the amount of labor in agriculture and underestimating the amount of labor in other sectors, because they do not capture much of the time spent in non-farm activities by rural residents. Rawski and Mead (1998) argue that this bias can be quite substantial. Moreover, economists using similar labor stock data in agricultural production functions frequently find insignificant or negative coefficients on the labor variable, just like Young (Rozelle, 2000). But when labor data is based on more specific information on the number of hours or standardized work days worked in a specific activity, the labor coefficients are frequently positive and significant.

Another problem with Young's analysis is aggregation. The crop composition of grain production and agricultural production changed significantly over the reform period, so combining aggregate grain output with the stock of agricultural labor supply is almost certain to introduce unknown sources of bias. Young also proxies agricultural productivity with grain output per worker, but a preferred measure would be net value added per worker, which reflects the economic value of the crop and controls for the costs of other inputs.

To reassess Young's empirical claims, we turn to provincial agriculture cost of production data for specific grain crops in different years. China's Ministry of Agriculture conducts annual farm surveys each year in most provinces to measure the amounts of inputs and outputs associated with the cultivation of different agricultural crops. Yields are measured through crop samples on randomly selected plots. If one knows the average amount of labor used per unit land for a specific crop as well as the sown area of the crop in the province, by simple multiplication one can estimate the amount of labor in the province used in cultivation of that crop.[3]

We analyze regional labor productivity differences for soybean, wheat, and corn—the grain crops for which there is broad regional data coverage over time.[4] Following Young, who plots provincial log grain yield and log labor per hectare, we first present simple plots of the log of net value added per mu and log of labor days per mu for the earliest and latest years of comparable data (1978-80 and 2000).[5] These plots avoid all of the potential criticisms just described. We find that for soybean, there is a much stronger positive relationship between labor and yield in 2000 than 1978, whereas for

[3] Aggregating across crops and livestock, it is then possible to calculate a provincial total agricultural labor variable (Rawski and Mead, 1998).

[4] Rice is problematic because there are multiple varieties that differ substantially in their production, and many regions grow more than one rice crop per year.

[5] Plots for different years for the same crop include the exact same set of provinces.

wheat, there is a similar positive relationship at both the beginning and end of the reform period. For corn, we find a pattern similar to Young, with a positive slope in 1980 and a flat slope in 2000, although the positive slope in 1980 is highly influenced by a few outliers. Also worth noting is the substantial increase in labor input into soybean and substantial decline in labor for wheat and corn. The strong result for soybean likely reflects the very active national market for soybean that has emerged in recent years. Wheat and corn were certainly subject to more government policy interventions than soybean, but also saw growing inter-regional trade. While corn trade may have been hampered by high transaction costs or trade barriers (Park et al., 2002), overall the strong stylized fact suggested by Young does not survive the use of better, more disaggregate data.

Next, we reproduce Young's regression estimates of production and input demand functions (Tables 1 and 2). The yield regressions produce a positive and significant labor coefficient for soybean, a positive, insignificant labor coefficient for wheat, and a slightly negative, insignificant labor coefficient for corn. So, again the results are mixed but better for market integration than Young's result that labor is negatively related to yield. We do not find highly significant contributions of Young's weather variables to yield, except for the case of corn. In estimating input demand functions for fertilizer and labor, we follow Young in reporting estimates with and without provincial dummy variables. With provincial dummies included, we find a negative and statistically significant effect of the interaction between weather and time for both fertilizer and labor in wheat production and for fertilizer in soybean production, but insignificant interactions for corn inputs. Thus, for none of the three crops does better weather both significantly affect yield and strongly predict greater input reductions. The results are considerably weaker than those reported by Young.

In focusing on agriculture, there are additional empirical features of developing economies that Young overlooks in interpreting the patterns in the data. There is an implicit assumption that if one can prove factor markets in agriculture are not regionally integrated, then it is possible to make an overall conclusion about protectionism in China. First, because agriculture affects food security which is often considered a vital political goal, the sector tends to experience much greater interventions by government than in other sectors, just as in many other developing countries. Nonetheless, despite episodic retrenchments, overall China's grain markets have seen remarkable deepening and integration over time (Rozelle et al, 1997, 2000; Park et al., 2002). Secondly, most developing countries observe large wage, or marginal productivity gaps between the agricultural and nonagricultural sectors. These gaps tend to grow during rapid industrialization but eventually fall as the labor force becomes predominantly urban and non-agricultural. In the U.S., structural change in the south contributed to reduced regional inequality and lower wage/productivity differences, but only after industrialization in the north had first widened both gaps. These processes of wage equalization across sectors take many years, because labor markets are often the slowest to become integrated (Williamson, 1990). In China, the coast has industrialized at an explosive pace and agricultural verson non-agricultural productivity differences have widened within coastal areas, even as regional differences in the opportunity cost of rural labor have also increased. Coastal provinces have better weather and industrialized faster. In this sense it is not surprising that labor is being pulled off of the land at a more rapid pace in those areas. This certainly reflects labor market imperfections, but similar imperfections would be expected in any large developing country like China, even without internal trade barriers.

5. Conclusions

This paper provides some initial challenges to Young's conclusion that China's internal markets have become less integrated over time because of trade restrictions. We critique the analytical assumptions and/or data of each part of his analysis, and offer alternative evidence which points us in a different direction. These results remain preliminary, with much additional work remaining. Nonetheless, we hope that this brief discussion helps suggest that evaluating internal market integration can be a messy business because the real world of rapid development and structural change has multiple and sometimes complicated consequences for patterns of regional production and specialization. China is complicated because it is a developing country, a transition country, and a globalizing economy all at once. Empirical assessments that are based on one perspective without thinking carefully about confounding processes are easily susceptible to bias.

References

Bai, Chon-En, Yingzhuan Du, Zhigang Tao, and Sarah Tong. 2003. *Local Protectionism and Regional Specialization: Evidence from China's Industries*, mimeo.

Batisse, Cecile, and Sandra Poncet. 2003. *Protectionism and Industry Localization in Chinese Provinces*, mimeo.

Imbs, Jean, and Romain Wacziarg. 2003. "Stages of Diversification," *American Economic Review* 93(1): 63-86.

Naughton, Barry. 1999. *How Much Can Regional Integration Do to Unify China's Markets?*, mimeo.

Poncet, Sandra. 2002. "A Fragmented China: Measure and Determinants of Chinese Domestic Market Integration," *CERDI Etudes et Documents*.

Poncet, Sandra. 2003a. *Domestic Market Fragmentation and Economic Growth in China*, mimeo.

Poncet, Sandra. 2003b. "Measuring Chinese Domestic and International Integration," *China Economic Review*

Rawski, Thomas, and Robert Meade. 1998. "In Search of China's Phantom Farmers," *World Development* 26(5): 767-81.

Sonin, Konstantin. 2003. *Provincial Protectionism*. William Davidson Institute Working Paper No. 557.

The World Bank. 1994. *China: Internal Market Development and Regulation* (Washington, D.C.: The World Bank).

Xu, Xinpeng. 2002. "Have the Chinese Provinces Become Integrated Under Reform," *China Economic Review* 13: 116-133.

Young, Alwyn. 2000. "The Razor's Edge: Distortions and Incremental Reform in the People's Republic of China," *The Quarterly Journal of Economics* 115(4): 1091-1135.

Rozelle, Scott, Albert Park, Hehui Jin, and Jikun Huang. "Bureaucrat to Entrepreneur: the Changing Role of the State in China's Grain Economy," *Economic Development and Cultural Change* 48(2): 227-252, 2000.

Rozelle, Scott, Albert Park, Jikun Huang, and Hehui Jin. "Liberalization and Rural Market Integration in China," *American Journal of Agricultural Economics* 79(2): 635-642, 1997.

Williamson, Jeffrey. 1999. "Globalization and the Labor Market: Using History to Inform Policy," in Aghion, Phillipe, and Jeffrey Williamson, Growth, Inequality, and Globalization: Theory, History, and Policy (Cambridge: Cambridge University Press), pp. 103-199.

Figure 1

Young's Regional Specialization Index for China

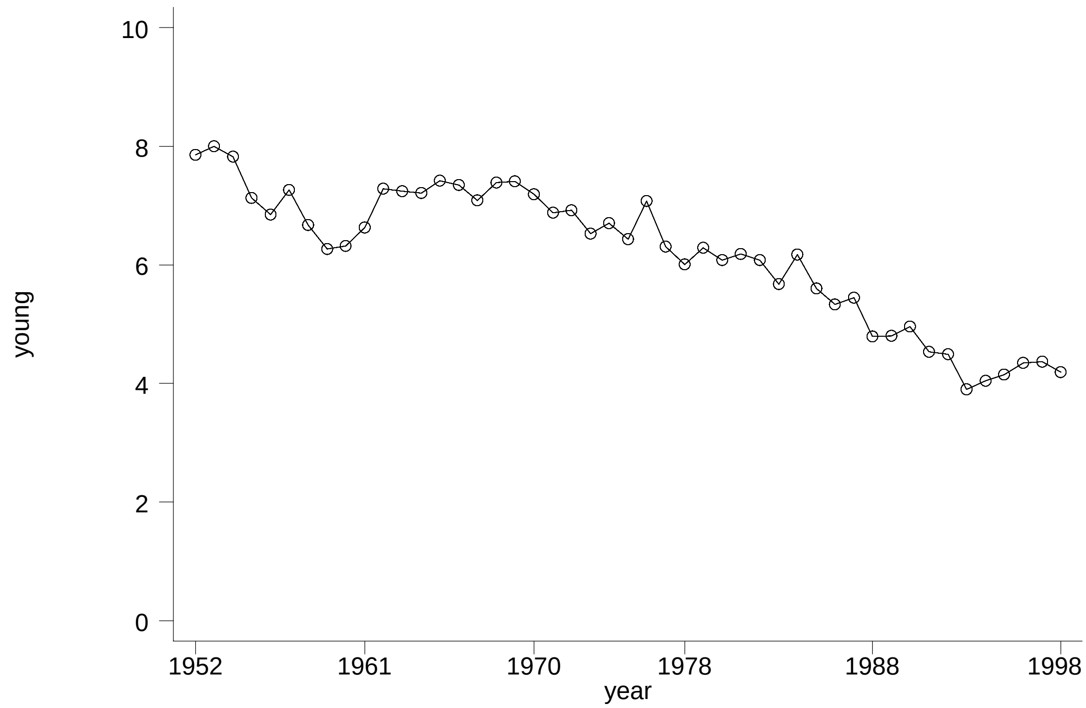


Figure 2
Adjusted Regional Specialization Index for China Controlling for Level of Development and Unobserved Provincial Effects

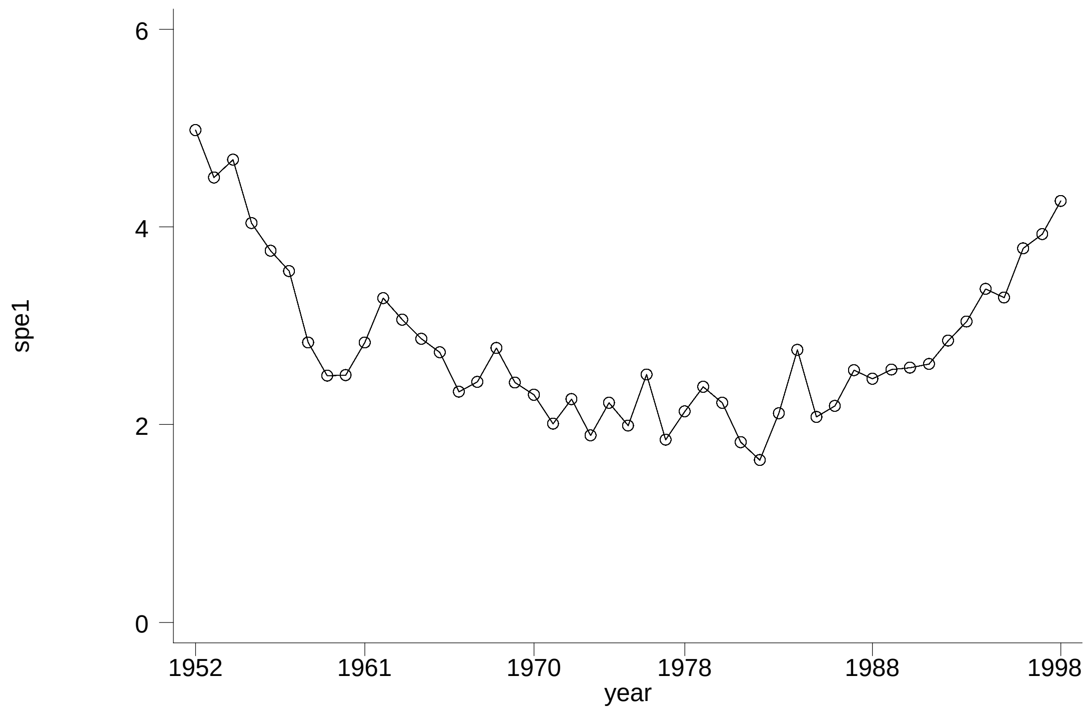
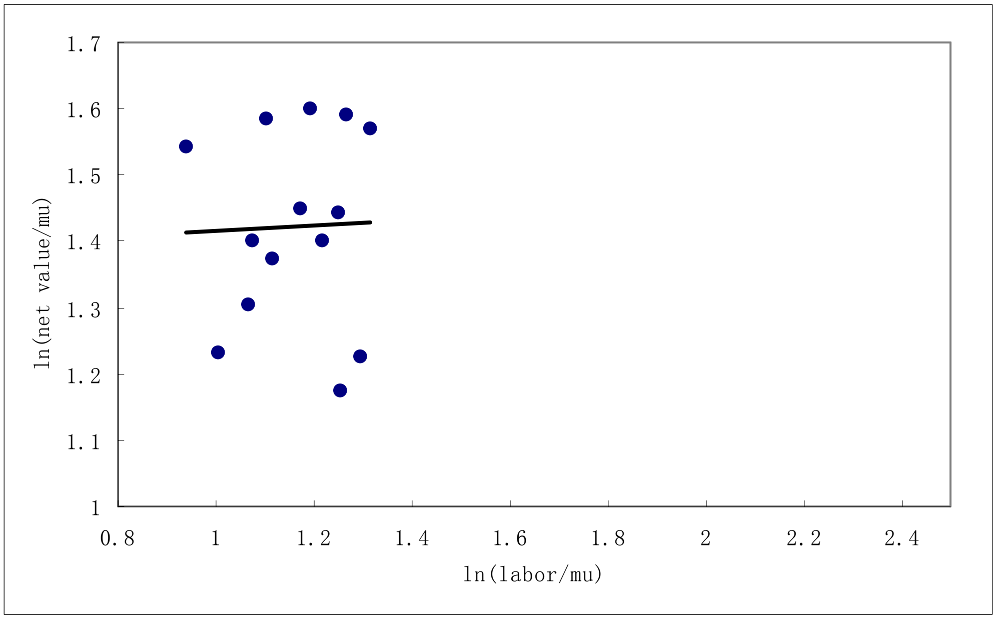
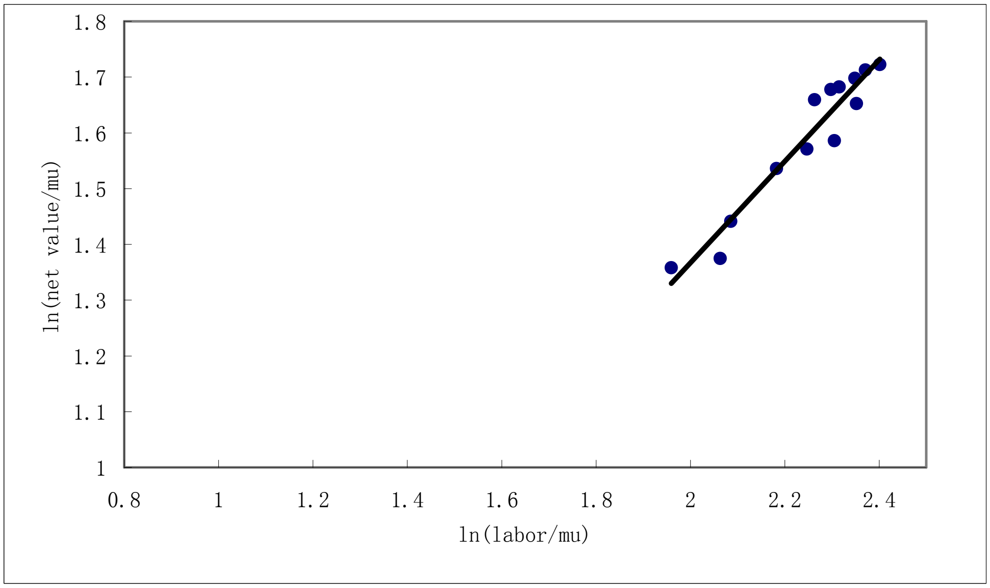


Figure 3
Soybean Net Value Added Per Mu and Labor Per Mu (14 provinces)

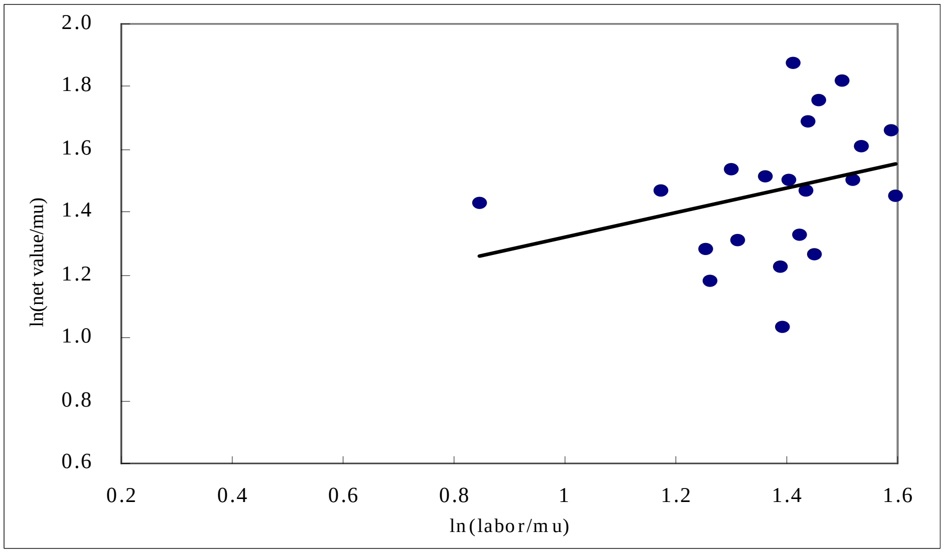


1978

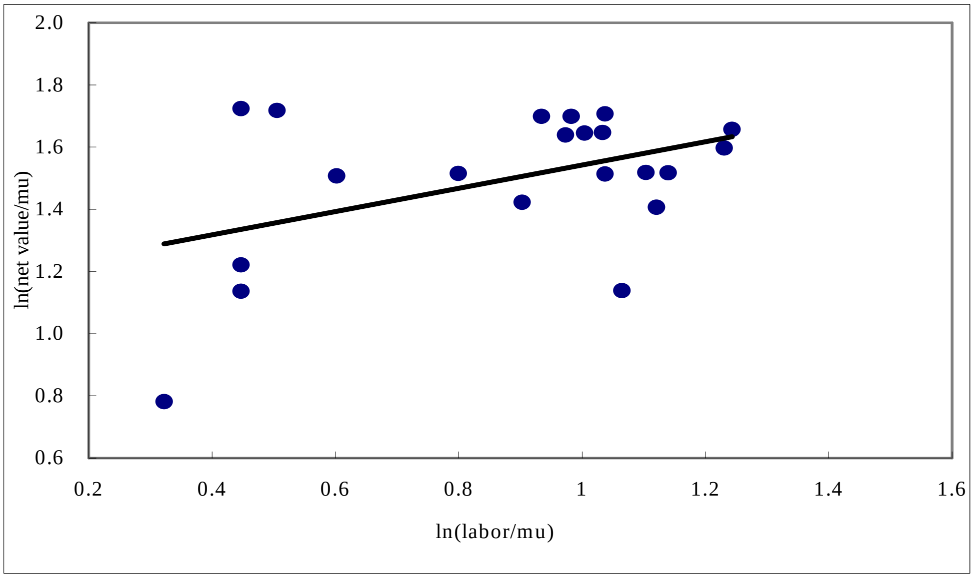


2000

Figure 4
Wheat Net Value Added Per Mu and Labor Per Mu (21 provinces)

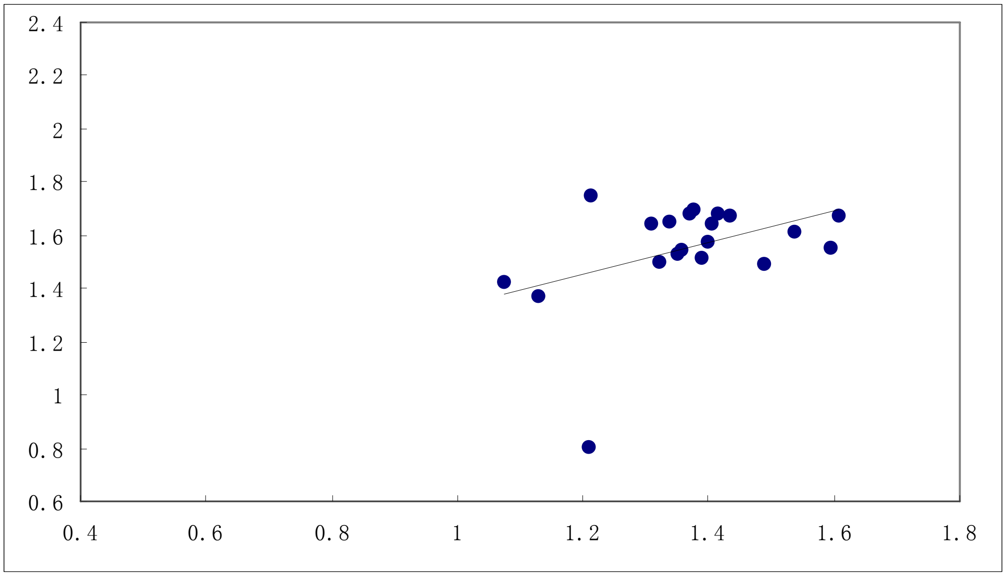


1979

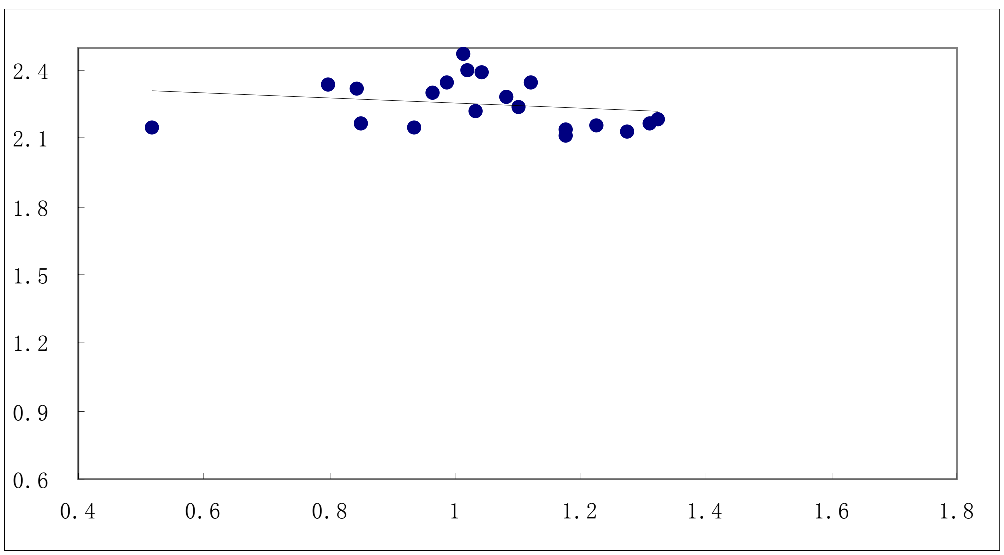


2000

Figure 5
Corn Net Value Added Per Mu and Labor Per Mu (20 provinces)



1980



2000

Table 1
Determinants of Yield of Soybean, Wheat, and Corn
(Coefficient Estimates)

	Soybean	**Wheat**	**Corn**
Year	.017 (2.20)	.019(4.14)	.026 (4.48)
Seed	.010 (.13)	.072(1.61)	.046 (1.26)
Fertilizer	.057 (2.67)	.035(2.10)	.051(2.65)
Labor	.26 (3.02)	.052(1.20)	-.0054 (.08)
Irrigation	.054 (.42)	.22(2.39)	-.073 (.74)
Power	-.064 (.49)	.024(.31)	-.088 (.80)
Prec	.034 (1.44)	-.014(.96)	.035 (1.83)
Prec2	-.001 (.80)	-.00016(.21)	-.0015 (1.35)
CV(Prec)	-.00076 (.01)	-.060(1.62)	-.12 (2.58)
R^2	.19	.55	.25
Number of obs	207	306	265

Table 2
Determinants of Fertilizer and Labor Demand

	Wheat		**Soybean**		**Corn**	
	Fertilizer	**Labor**	**Fertilizer**	**Labor**	**Fertilizer**	**Labor**
With provincial dummies						
Year	-.073(6.11)	.0008(.18)	-.0097(.39)	.0058(.96)	-.077(5.66)	-.0065 (1.65)
Wtime	**-.68(2.62)**	**-.49(5.20)**	**-1.46 (2.80)**	-.04(.32)	-.081(.25)	-.0076 (.08)
R^2	0.25	.004	.07	.064	.25	
Without provincial dummies						
Year	-.072(4.41)	.0034(.25)	-.006(.17)	.012(.89)	-.075 (5.05)	-.0046 (.41)
Wtime	-.51 (1.45)	-.50(1.70)	**-1.70(2.26)**	-.22(.82)	-.12 (.33)	-.066 (.25)
Weather	.60(.24)	**8.02(3.96)**	**11.11(2.12)**	**13.60(7.22)**	-2.19 (.87)	**7.34 (3.85)**
R^2	.25	.08	.11	.41	.25	.15
N	307	307	207	207	265	265