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THE RAZOR'S EDGE:  
DISTORTIONS AND INCREMENTAL REFORM  
IN THE PEOPLE'S REPUBLIC OF CHINA

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The Razor's Edge: Distortions and Incremental  
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**ABSTRACT**

In a partially reformed economy, distortions beget distortions. Segments of the economy which are freed from centralized control respond to the rent seeking opportunities implicit in the remaining distortions of the economy. The battle to capture, and then protect, these rents leads to the creation of new distortions, even as the reform process tries to move forward. In this paper I illustrate this idea with a study of the People's Republic of China. Under the plan, prices were skewed so as to concentrate profits, and hence revenue, in industry. As control over factor allocations was loosened, local governments throughout the economy sought to capture these rents by developing high margin industries. Continued reform, and growing interregional competition between duplicative industries, threatened the profitability of these industrial structures, leading local governments to impose a variety of interregional barriers to trade. Thus, the reform process led to the fragmentation of the domestic market and the distortion of regional production away from patterns of comparative advantage.

“Sages say the path [to salvation]  
is narrow and difficult to tread,  
narrow as the edge of a razor.”\*\*

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(\*\*)From the Katha-Upanishad, as translated by Mascaro [1965]. A similar message appears in the New Testament: “Enter ye in at the strait gate: for wide is the gate, and broad is the way, that leadeth to destruction, and many there by which go in thereat: Because strait is the gate, and narrow is the way, which leadeth unto life, and few there be that find it.” Matthew 7: 13-14.

## I. Introduction

Analyses of the transition to market in centrally planned economies have identified two potential pitfalls in the process of incremental economic reform. First, the removal of government mandated controls in one part of the economy, in the context of continued distortions elsewhere, can, for standard second best reasons, lead to a fall in output [Murphy, Shleifer, and Vishny 1992]. Second, political opposition may develop along the path of reform, stalling the reform process or reversing it altogether [Dewatripont and Roland 1995, Martinelli and Tommasi 1994]. In this paper I use the reform experience of the People's Republic of China to highlight a third potential pitfall. Incremental reform releases segments of the economy from centralized control, while maintaining, for a prolonged period, many of the distortions of the central plan. The freed segments of the economy find it profitable to exploit the rent seeking opportunities implicit in the remaining distortions of the economy. Their attempts to capture, and then protect, these rents leads to the creation of new distortions. In this sense, the reform process can be derailed; while some distortions are eliminated, moving the "train" of the economy to market, others are added, drawing it off on unexpected tangents.

As early as 1986, the government of Zhejiang province began to restrict the sale of silk cocoons to other parts of China. Each harvest season the government bureaucracy, from the provincial level all the way down to village units, and including police and militia forces, was mobilized to ensure that Zhejiang's silk farmers sold their silk cocoons locally, for local processing or direct export. Under the plan, the prices of raw materials such as silk were kept artificially low while the prices of final goods, such as silk fabric, were kept high. During the 1980s, with the relaxation of central controls on rural industry, locally controlled silk processing industries developed rapidly in Zhejiang, a traditional producer of silk cocoons, to capture the rents implied by the artificial price wedge. The trade embargos of the mid 1980s onwards appeared as other provinces tried to purchase silk cocoons, at above planned procurement prices, directly from

Zhejiang farmers, bidding away the rents the Zhejiang government could acquire from local processing or direct export.<sup>1</sup> In the first half of 1988 silk factories in Shanghai, located next door to Zhejiang and Jiangsu, the principal domestic producers of silk, received only 40 tonnes of their planned allocation of 2000 tonnes of raw silk. In a country which, all by itself, accounted for 60% of world production and 90% of world exports of raw silk, Shanghai found itself in the surprising position of using valuable foreign exchange to import silk for its factories.<sup>2</sup>

The "silkworm cocoon war" described above was just one of the many interregional trade conflicts, in both raw materials and finished manufactured goods, which appeared in the People's Republic during the 1980s and 1990s. While a full description of the factors behind this interregional conflict will be given further below, it is worth outlining the main features of the argument at this stage. Under the central plan raw material prices were kept low and final goods prices high, generating substantial surpluses in manufacturing and processing industries, which funded the government budget. As central controls over factor and material allocations were relaxed, local governments throughout the country moved to develop manufacturing industries and restrict the outward movement of raw materials, in an attempt to capture the rents implicit in centrally mandated price wedges. Growing overcapacity in a number of industries, combined with the elimination of central controls over prices and the growth of interregional free marketing, threatened industrial profit margins and led to burgeoning trade conflicts as local governments tried to control prices and limit "foreign" competition using a variety of administrative and physical barriers to interregional trade. Having developed financial and political interests in a particular industrial and price structure, local governments continued to defend those interests, even after the original motivating factors (i.e. centrally mandated distortions) had largely disappeared. The removal of these new distortions posed an additional challenge to reformers intent

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1. See Chen [1994], preface pp. 1-2 and text pp. 7-8.

2. Far Eastern Economic Review (hereafter, FEER), "In a spin" (23 March 1989).

upon moving the economy toward free market institutions.

This paper proceeds as follows: Section II below, "Stories," develops a fuller description of how incremental reforms in the People's Republic devolved power to local governments and led to the development of competitive local industrial policies and interregional barriers to trade. Section III, "Data", leavens the argument with data on the interregional dispersion of output and prices. I show that there was widespread convergence in the structure of output during the reform period, as the different provinces duplicated each other's industries. Regarding prices, I observe a divergence in regional prices in the late 1980s, followed by fluctuating rounds of convergence and divergence (without overall trend) during the 1990s. These data are supportive of the anecdotal narrative. They are, however, also consistent with a variety of other explanations. One might argue, for example, that the data on production are explained by the opening of China to the world economy which, given similarities in factor endowments, has led the different regions to find their comparative advantage in a common industrial structure. To put this and other alternative explanations to rest, Section III also presents data on the variance of regional labour allocations and labour productivities, showing that these diverged substantially during the reform period. The combination of converging outputs and diverging factor intensities is grossly inconsistent with appeals to free market mechanisms and comparative advantage, but is, again, compatible with the possibility of growing interregional barriers to trade.

To establish the argument that the reform process led to the creation of new distortions, one needs, ultimately, to provide direct evidence of increasingly irrational factor allocations. To this end, Section III draws, as its final piece of evidence, on data on factor allocations and yields in agriculture. I show that while labour intensity (labour per hectare) and yields (grain tons per hectare) were positively correlated under the plan, this relation completely disappeared during the reform period, as the provinces with the highest agricultural yields shed labour. Focusing on a more precise measure of agricultural comparative advantage, the quality of the weather, I show

that during the reform period provinces with good weather increasingly applied less labour, fertilizer, irrigation and power resources to agricultural cultivation. These results are consistent with a movement toward regional autarky. Section IV concludes the paper, while an Appendix details the statistical sources used in each part of the analysis.<sup>3</sup>

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3. This is not the first paper on interregional trade conflict in the People's Republic, which has received a great deal of attention in the Chinese media and scholarly journals (see the citations in Section II below, as well as the translated articles in Chinese Economic Studies, Fall 1993). A World Bank study led by Kumar [1994a,b] represents the best attempt to move beyond anecdotes and present statistical evidence of aggregate effects. Kumar compared the degree of industrial dispersion in China, the United States and the European Community, breaking each political unit into 12 regions, and found that China's production structure was substantially more diversified. It is difficult to evaluate this comparison, however, given differences in stages of development and the size of the economic units involved. Kumar also used data provided by the State Statistical Bureau to examine trends in interprovincial retail purchases, finding evidence of a decline in interprovincial trade. However, unbeknownst to the World Bank mission, the data provided by the SSB (aside from containing numerous errors and mixed data types) included the value of interprovincial trade transactions with non-state commercial departments in the value of intraprovincial purchases (i.e. excluded them from the measure of interprovincial trade). This makes interpretation of the declining "trade ratio" problematic. In an appendix, available from the author, I provide a more complete discussion of the statistical definitions underlying these data on commercial transactions.

Other statistical studies of this issue have been of lesser quality. For example, a team from the Chinese Academy of Social Sciences [1993] presents a variety of data on the interprovincial trade of six provinces. The tables in the paper are mutually contradictory and the article concludes, at different points, that for most of these provinces the relative role of interprovincial trade was both rising and falling (during the same time period).

## II. Stories

Any review of the reform period must, perforce, take as its starting point the legacies of 30 years of central planning. Three aspects of the planning system, in particular, had a profound influence on the development of local policy during the 1980s.<sup>4</sup> First, as shown in Table I, revenue collection under the plan was concentrated in the industrial sector which, by the mid-1960s, accounted for three quarters of the consolidated budgetary revenue of the central and local governments.<sup>5</sup> With the prices of raw materials kept artificially low relative to the prices of final industrial goods, industrial processing enterprises reaped unusually high returns, which were then handed over to the government, either in the form of turnover (indirect) taxes or through the direct remittance of profits. Wong [1992] explains that this system was patterned after the Soviet model of the 1920s, in which "price scissors" generated large industrial surpluses which could then be used to fund the development of industry. In the context of government control of most economic sectors, this motivation is peculiar. Presumably, profits could just as easily have been concentrated in raw material sectors such as agriculture or final sales sectors such as commerce,

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4. Public administration in the People's Republic is formally divided into five levels: (1) central government; (2) provinces, including provincial-level cities; (3) prefectures, including prefectural-level cities; (4) counties, including county-level cities; and (5) townships [Wong et al 1995, p. 82]. The levels of subnational government have evolved over time, e.g. the townships were established in 1983 to replace the old communes, while by the mid-1990s villages, although having no independent budgetary status, had developed their own systems of revenue and expenditure [Wong 1997, pp. 190-199]. There is also substantial regional variation in administrative relations, e.g. in Jiangsu the provincial government bypasses the prefectural level and signs revenue contracts directly with the counties [Wong et al 1995, p. 99], while in other regions cities have taken over the direct administration of neighbouring counties [Unger 1987, p. 37]. Given these difficulties, in the discussion which follows I eschew any attempt to tease out subtle distinctions between levels of government. Instead, I follow the standard PRC practice of using the term "local" to encompass all levels of government at the provincial level and below and focus on the overall process by which power was devolved into the hands of these sub-national levels of government.

5. As the Chinese definition of revenue has evolved over time, I adjust the official data to construct a consistent series. This, and issues such as extra-budgetary and off-budget finance, which are not included in the Table, are discussed in the Appendix.

and then used to finance the development of industry.<sup>6</sup> It could be the case that these rents and price wedges simply represented the combination of ideological bias (e.g. frivolous consumer goods such as watches and fans should be expensive while valuable raw materials such as coal should be available to all at low cost; industry is important and hence industry, and not agriculture or commerce, should generate revenue) and practical expediency (e.g., it is easier to collect the revenues of a few silk processing centres than to tax the incomes of thousands of silk growing collectives). For whatever reason, industry was paramount as a source of revenue. During the reform period, with the rise of raw material prices and the introduction of contracting/incentive profit retention systems, the role of industry in revenue collection declined. Nevertheless, the sector still accounted for almost half of all budgetary revenue in 1995.

Second, as shown in Figure I, historically most of government revenue was nominally "local revenue", collected by local government authorities and then handed over to the central government. In the mid-1970s, just prior to the reforms, local revenue amounted to almost seven times central revenue. As the Figure shows, during the 1980s the ratio of local to central revenue collection declined rapidly as the central government increased its share of revenue collection. These figures, however, conceal the fact that, with the exception of some centrally-controlled enterprises, most of so-called "central" revenue has actually always been collected by local authorities, simply because the central government has never possessed a nationwide tax bureaucracy.<sup>7</sup> Thus, under the plan, and even during the reform period, most revenue was collected by

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6. For example, the large turnover taxes, which were included in the factory sales price of manufactures and therefore collected from industry, could just as easily have been levied after goods were shipped to distributors, and hence been collected from the commercial sector.

7. Wong [1991a]. In 1989 China's State Tax Administration had a total staff of 450 persons in Beijing and another 150 persons nationwide. The remaining half a million tax collection officials were appointed by local governments. In 1994 separate central tax bureaus were established, with some fanfare, in the various provinces. Early foreign press reports, however, indicated that these new bureaus possessed "two name plates but one staff," i.e. were still part of the local bureaucracy. See FEER, "Fiscal feudalism" (6 April 1989) and "The Grip Slips" (May 11 1995).

local governments, designated as "local" or "central", and then transferred from local coffers to central coffers and, frequently, back again. The obfuscation inherent in the bilateral transfers of this system should not blind one, however, to the crucial fact that it was local governments, and not the central government, that had the long standing fiscal ties with enterprises throughout the economy.

A third legacy of the pre-reform era was the duplication of industries across provinces and the active involvement of provincial and local authorities in economic planning. Enjoying, by the mid-1960s, hostile relations with its neighbours in almost every direction, the People's Republic began a conscious attempt to develop duplicate sets of industries in each region and province, so as to be better able to sustain economic activity in the event of a foreign invasion. This policy extended beyond the duplication of key military industries to a general programme of promoting local self-sufficiency in most areas of industrial production. Pressed by the complexity of directing the growing number of small local enterprises, and probably dislocated by the political events of the time, the central planning apparatus during the Cultural Revolution (1966-1976) increasingly relinquished control of detailed planning to provincial authorities, focusing, instead, on managing the interprovincial transfer of key materials and products.<sup>8</sup> With material supplies only ensured when one actually produced them oneself, and with the central regime actively encouraging and funding the local development of industries, each province,

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8. See Naughton [1991] and Wong [1985, 1991b]. The description above sounds more coherent than the system actually was. For example, almost all enterprises were decentralized to local control but, when their management proved too complex for provincial authorities, put under the planning of central ministries (while remaining locally "controlled" enterprises). At the same time, the staff of the central planning agencies (material supply, statistics, etc.) was liquidated, falling to a total of 610 employees in 1970. In the words of no less an expert than Perkins [1988]: "By some mechanism, inputs and outputs and their allocation between enterprises were coordinated in a way that avoided the chaos of the Great Leap Forward, and this coordination was in no sense achieved through a revived market mechanism...It is not clear just who in the bureaucracy did much of the planning and control of enterprises, but planning and control through the bureaucracy did take place."

county, city and locality tried to develop its own duplicate set of industries.<sup>9</sup> It is important to note, however, that despite the widespread industrial diversification, central controls over entry into high margin industrial sectors were maintained [Wong 1988] and, consequently, industrial rents remained concentrated in a few select regions. Thus, in 1981, Shanghai, with its important processing industries, earned budgetary revenues equal to 10 times total expenditures and, while producing only 7% of GDP, accounted for 45% of the total net local to centre transfer of budgetary funds in the economy.<sup>10</sup>

With this background in mind, I now turn to a review of developments during the reform period. From almost the very beginning, the central government sought to improve the efficiency of industrial production and public administration by hardening the budget constraints of both state enterprises and local governments. Beginning in 1979, the historical system of full remission of enterprise surpluses (and central coverage of losses) was replaced with contracts specifying the division of profits between the government and enterprises, with incentives for exceeding historical values. Unfortunately, each enterprise, in each locality, operated under unique historical circumstances. Some enterprises had unusually large or small capital stocks, others produced goods where profits were high or low because of distortions in state prices, whereas still others were engaged in the difficult production of goods in unusual locations (as mandated by the pre-reform policy of industrial diversification). Consequently, contracts had to be negotiated on an enterprise by enterprise basis, with opportunities for renegotiation and

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9. Wong [1985] recounts how in Huangshi city (Hubei) there were four iron and steel mills: one setup by and beholden to the central government, one established by the provincial authorities to meet their needs, one setup (near the other two mills) by the municipal government to meet its requirements, and one established by the suburban county, which, needing only 3000 tons of pig iron a year, could not get its requirements satisfied by allocations from other producers.

10. I calculate Shanghai's net transfer as the difference between its revenues and expenditures since the provinces are not supposed to engage in debt finance and, with the exception of the rollover of small surpluses and deficits, appear to maintain budget balance on an annual basis. Estimated from China's Public Finance Statistics 1950-1985, pp. 54 and 92.

renege ment (by both sides).<sup>11</sup> Similarly, beginning in 1980, under the policy of *fenzao chifan* ("eating in different kitchens"), the central government attempted to separate the central and local budgets by establishing revenue contracts with the local authorities. As in the case of industrial enterprises, each province's circumstances were unique, requiring a different contracting system. Thus, some provinces remitted a lump sum tax, others remitted a proportion of total revenue, while, in still other cases, revenue sources were divided between central, local, shared and "adjustment" (subject to yet another formula for sharing). Budgetary contracts, while often "established" for five year periods, were, again much like enterprise contracts, subject to frequent renegotiation as circumstances and policies changed.

For all its imperfections, the contracting system undoubtedly hardened local and enterprise budget constraints and improved fiscal and industrial efficiency by providing an objective function (albeit moving) with marginal rates of central taxation well below 100%. In the process, however, it inadvertently devolved power to local authorities and strengthened the ties between local governments and state enterprises. Enterprise contracting shifted power from the centre to local governments since these, with their historical tax and administrative ties with enterprises and detailed knowledge of local circumstances, were best positioned to negotiate and monitor contracts for themselves and the central government. The hardening of local budgets increased the interest of local authorities in industrial enterprises, where the main revenue surpluses were to be found. Local governments could control input prices and costs, minimizing reported "profits" (which might have to be shared with the centre), while still maximizing the surpluses available for local coffers. While local governments could draw revenue from industry, their broader interest centred around the financial well-being of state enterprises as these traditionally provided

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11. The *li gai shui* (tax-for-profit) system, advanced in 1982-1985, sought to limit the need for detailed bargaining by introducing a complex set of interlocking and compensating universal tax rates which, varying by product, assets, etc., would compensate for all of the pre and post-plan distortions. However, the *li gai shui* initiative met with strong opposition and by 1986 was abandoned in favour of a return to enterprise by enterprise contracting.

housing and a wide variety of social services (e.g. health, retirement, disability, burial, recreation, etc.) to their workers. In sum, in attempting to harden budget constraints, in the context of continued price distortions and no attempt to clarify the residual ownership of enterprises or separate their social from their industrial functions, the central government merely transferred enterprise control, and the responsibility for sustaining enterprise well-being, down to the local level.<sup>12</sup>

A second, critical, reform initiative focused on the development of rural industry as a means of absorbing surplus resources (i.e. labour) in the countryside. Beginning in 1977, the decline in central procurement of farm products and capital equipment and the introduction of rural labour responsibility systems freed material, capital and labour resources for use by rural enterprises. While rural industry, as it developed during the Cultural Revolution, had previously been restricted to sectors with small margins, such as agricultural machinery repair and farm tools, these restrictions were now removed. Further, the central government actively encouraged the development of rural industry by instructing the Agricultural Bank of China to provide low-interest loans, requiring that half of state budgetary allocations to communes be used for rural

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12. For a history of reforms in enterprise taxation and how these enlarged local power, see Naughton [1985] and Wong [1987, 1992]. FEER, "The Grip Slips" (May 11, 1995) provides a recent review of the degree to which central government control over finance has devolved into the hands of local authorities. Song [1992] and Wong [1992] review the different types of central-local contracting systems.

I should note that there also appears to have been a more direct transfer of political power down to local levels. China, like other communist countries, uses a *nomenklatura* system, in which each level of government has a list of positions over which it exercises power of appointment (which usually includes personnel in the next lower level of government). In 1983, as part of a plan to decentralize and improve the efficiency of personnel management, two-thirds of the positions controlled by the Central Committee were transferred down to lower levels. Provincial and prefectural party committees also transferred control down to lower levels with, as an extreme example, the provincial government of Heilongjiang retaining only 23 percent of its original positions [Burns 1987]. It is difficult, however, to evaluate the practical significance of these reforms as there was already significant consultation with lower level authorities who had no formal *nomenklatura* authority (see Manion 1985, p. 217), while the length of the original lists (the Central Committee exercised direct control over 13,000 appointments and oversight over tens of thousands more) would have led to substantial rubber stamping of lower level proposals.

enterprise development, and instructing central and local authorities to incorporate the supply of rural enterprises into their plans.<sup>13</sup> Most importantly, three year tax holidays were granted to particular industries (e.g. cement plants) and to all enterprises which might have some initial difficulty in paying taxes, which, in practice, ended up granting exemption, on all income and turnover taxes, to all new enterprises. With turnover/indirect taxes as high as 66% in some sectors, tax exemptions were crucial, allowing rural enterprises, even inefficient rural enterprises, to capture the rents implicit in the margins enjoyed by firms in the urban processing centres. Local governments, spurred on by central initiatives aimed at hardening their budget constraints, naturally supported this shifting of rents which, in the absence of well developed private capital markets to support investment, was mostly undertaken by collective organizations. While tax exemptions denied the central government any share of the captured rents, informal local levies could determine their distribution between the collective organizations and local government coffers. In 1984 contributions for local social expenditure and other levies amounted to 44% of the nationwide after-tax profits of rural enterprises [Wong 1988].

The growth of rural industry as the arbitrager of artificial price wedges inevitably led to the development of interregional trade barriers. Local governments in regions which traditionally produced raw materials moved downstream into processing, diverting outward bound raw material shipments, at low planned prices, to their own factories. Traditional processors, starved of material inputs, responded by sending buyers to raw material districts, offering above plan prices directly to raw material producers such as farmers. Since their financial interests were linked to processing, and not raw material production, governments in raw material producing districts moved to prevent these sales, using trade barriers to turn themselves into monopsony buyers of

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13. As with all Chinese policies, there were zigs and zags. In 1981-1982 rural entry into some sectors was restricted and some rural enterprises were forcibly shut down. By 1984, however, these policies had been reversed in favour of further bank lending and the removal of most restrictions on entry.

raw materials at low prices. This led to the development of "wars" over coal, cotton, jute, silk-worm cocoons, and tobacco, among other materials.<sup>14</sup> In the area of finished goods, such as high margin light industrial consumer products, the duplication of production throughout the country led, reportedly, to growing overcapacity. As central controls over prices were relaxed and private marketing channels developed, rural producers found themselves in competition with each other and with the traditional, more efficient, producers of finished products. To protect their industrial interests, provincial, county and, even, city governments found it expedient to erect barriers to trade so as to maintain high local final industrial goods prices. Aside from tariff barriers (i.e. special charges levied at road blocks), non-tariff methods such as physical barriers, outright prohibition, low interest loans and other financial benefits for commercial establishments marketing local goods, fines for commercial establishments marketing non-local goods, legal restrictions on price differences between local and non-local goods sold in commercial establishments, local purchasing quotas, and administrative trivia (e.g. medical, sanitation, epidemic prevention, product quality, measurement and other such licences and certificates) were used to hamper trade in products as varied as textiles, automobiles, trucks, perfumes, beverages, plastics, matches, household electrical appliances, electrical machinery, bicycles, pens, alcohol, washing

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14. In the Chinese press, coverage of the battles to control resources, the diversion of planned allocations to local industry, the interpretation of local motivations as an attempt to capture the rents implicit in price wedges, and the role the hardening of local budget constraints played in spurring official intervention can be found in: Beijing Domestic Service 1100 GMT 24 May 86; Beijing Xinhua Domestic Service 1133 GMT 6 Dec. 1994; China Daily (Beijing, Business Weekly) 10 Dec. 1990 p. 4.; *Jingji Cankao* (Beijing) 4 June 1990 p. 1, 27 April 1990 p. 1, 24 June 1990 p. 1, and 20 July 1990 p. 1; *Jingji Guanli* (Beijing) No. 12 (Dec. 1989) pp. 18-21; *Jingji Ribao* (Beijing) 11 Nov. 1989 p. 2; *Jingjixue Zhoubao* 30 April 1989 p. 1; *Renmin Ribao* 11 June 1990 p. 6; *Zhongguo Tongxun She* 0355 GMT 11 Aug. 1989; and *Zhongguo Wujia* No. 2 (Feb 95) pp. 13-17; See also FEER, "Trouble at mill" (7 March 1991) and "Protection Has a Price" (August 29 1996). With the exception of the FEER, all Chinese and Hong Kong news services cited in this section are as reported and translated in the Foreign Broadcasting Information Service.

powders and soaps, tires, tractors, engines, processed foods, and food flavourings.<sup>15</sup> The legal system was also subverted, as enterprises were encouraged not to pay non-local bills, the courts ignored non-local pleas, rulings and fines were issued against non-local producers, and judges who ruled in favour of non-local firms were punished.<sup>16</sup>

While the central regime railed, in a number of circulars, against interprovincial trade wars, sent down task forces to mediate conflicts at provincial borders and even went so far as establishing a separate ministry, the Ministry of Internal Trade, whose main purpose was to enliven "circulation" and distribution, its other policies inadvertently encouraged interregional conflict.<sup>17</sup> Thus, for example, the allocation of special trading rights on a regional basis, in particular to the Special Economic Zones and Guangdong province, led to conflict as other regions tried to prevent the loss of export earnings brought about by the diversion of their exports to

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15. For coverage of the trade barriers, reference to the growing overcapacity of a number of industries brought about by excessive duplication, and interpretation of the interventions of local governments as stemming from their financial relations with industrial enterprises, see *China Daily* (Beijing) 9 June 1990 p. 1; *Ching Chi Tao Pao* (Hong Kong) No. 9 (5 March 1990) pp. 8-9 and No. 37-38 (28 Sept. 92) pp. 12-15; *Fazhi Ribao* 19 April 1993 p. 1; *Guangming Ribao* 3 Nov. 1990 p. 3; *Guangxi Ribao* 3 Feb. 1994; Hangzhou-Zhejiang Provincial Broadcast Service 1000 GMT 21 Dec. 1990; *Jingji Cankao* (Beijing) 24 June 1990 p. 1 and 4 June 1990 p. 1; *Jingji Ribao* (Beijing) 14 July 1990 p. 2; *Liaowang* (Beijing) No. 45 (6 Nov. 1989) pp. 18-20; *Qunyan* (Beijing) No. 2 (7 Feb. 1991) pp. 22-23; *Renmin Ribao* 30 July 1990 p. 2 and 5 June 1990 p. 5; *Shanxi Ribao* 1 Dec. 1995 p. 1; *Ta Kung Pao* (Hong Kong) 22 June 1990 p. 2; *Tangtai* (Hong Kong) No. 41 (8 Sep. 1990) pp. 13-14; *Wen Wei Po* (Hong Kong) 24 Jan. 1991 p. 6; *Xinhua* Domestic Service 0133 GMT 18 July 1984, 0815 GMT 8 May 1990, 1031 GMT 10 April 1990, and 0400 GMT 29 March 1992; and *Zhongguo Tongxun She* (Hong Kong) 0909 GMT 11 Feb. 1990. See also *Economist*, "China's feuding regions" (20 April 1996) and *FEER*, "Opening doors" (2 April 1992).

16. On the use of the legal system, see *Jingji Cankao* (Beijing) 1 April 1990 p. 4.; *Renmin Ribao* 10 Dec. 1991 p. 5; and *Tangtai* (Hong Kong) No. 41, 8 Sep. 1990 pp. 13-14.

17. Chen [1994, pp. 2, 33-36] indicates that central task forces were sent down, on an annual basis, to mediate disputes at Zhejiang's borders. He also notes that circulars and directives against interregional trade barriers were issued by the State Council, Party Congress, People's Congress, etc. in 1980, 1981, 1982, 1984, 1985, 1987, 1988, 1989, and 1990. The establishment of the Ministry of Internal Trade and its mission are highlighted in Beijing Central Television Program One Network 1100 GMT 10 April 1993; *China Daily* 29 July 1993 p. 1; and *Renmin Ribao* 2 August 1993 p. 2.

these gateways to the international market.<sup>18</sup> Perhaps the most destructive element, however, was the central regime's policy on price controls. During the Cultural Revolution, in recognition of the fact that the policy of forced industrial diversification led to inefficient production, the central regime allowed localities to set their own, higher, final goods prices [Wong 1987]. This policy was maintained, and apparently expanded, during the reform period. With each round of price liberalization, while the central government reduced the number of centrally mandated price controls it simultaneously acquiesced to, explicitly allowed or, in some cases, even vigorously mandated, the local maintenance of price controls.<sup>19</sup> In a planned economy, where state

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18. While most regions were only allowed to retain about a quarter of the foreign exchange generated by their exports, Shenzhen SEZ (in Guangdong) was allowed to retain 100%. In 1988, Hunan and Guangxi were reported to be patrolling their border with Guangdong province, restricting the movement of goods to their neighbour. Senior officials in both provinces complained that goods shipped to Guangdong for subsequent export as "Guangdong" goods robbed them of valuable foreign exchange. *FEER*, "Beggar thy neighbour" (12 January 1989). See also *China Daily* 4 April 1989 p. 4 and *Zhongguo Xinwen She* 1344 GMT 2 April 1992.

19. The nationwide decontrol of grain prices in 1992-1993 provides a wonderful example of policies working at cross purposes. While the price of grain was supposed to move to market levels, government pronouncements, at both the national and local level, stressed the importance of provinces, prefectures and even localities keeping adequate grain reserves so as to manage the price of grain in their jurisdiction. Similarly, localities were urged to improve "price inspection" (for what purpose?) and to switch from mandatory grain procurement "quotas" to voluntary purchase "contracts", which would ensure that prices did not rise too high or fall too low. One wonders how any of this could be accomplished without barriers to trade. See Jiangsu People's Radio Network 1015 GMT 23 March 1993; *Liaowang* Overseas Edition (Chinese, Beijing) No. 51 (21 Dec. 1992) p. 2; *Xinhua* Domestic Service 0734 GMT 2 April 1993 and 2102 GMT 22 April 1993; and *Zhongguo Xinwen She* (in English) 0844 GMT 3 Oct. 1992.

Explicit reference to the rights of local authorities (even below the provincial level) to set their own prices is made in *Jingji Ribao* (Beijing) 8 June 1990 p. 3; *Xinhua* (Domestic Service) 0830 GMT 24 Feb. 1993 and 0531 GMT 13 March 1994; *Xinhua* (English) 1435 GMT 2 Sep. 1989; *Zhongguo Wujia* No. 8 (Aug. 1995) pp. 16-18; and *Zhongguo Xinwen She* 0915 GMT 4 Sep. 1993 and 1228 GMT 19 Oct. 1994. Examples of general reports on provincial price controls and subsidies are given by Changsha Hunan Provincial Service 2300 GMT 24 Jan 1990; *China Daily* (Business Weekly) 10 Jan. 1993 p. 3; Harbin Heilongjiang People's Radio Network 1000 GMT 8 April 1994; Hefei Anhui Provincial Service 1100 GMT 30 Dec. 1988; *Nanfang Ribao* (Guangzhou) 19 March 1991 p. 1; Nanjing Jiangsu People's Radio Network 2300 GMT 23 July 1993; *Renmin Ribao* 6 Aug. 1990 p. 2 and 6 Oct. 1990 pp. 1 & 4; Shanghai City Service 0900 GMT 13 Sep. 1989; Wuhan Hubei People's Radio Network 1000 GMT 12 May 1994; *Xinhua* (English) 1103 GMT 30 Dec. 1988, 1507 GMT 20 Jan. 1990 and 0946 GMT 30 Nov. 1992; and *Zhejiang Ribao* 27 July 1994 p. 1. The *FEER* ("The power of the purse," 18 June 1987) reports that central attempts to free (and rationalize) the prices faced by industrial enterprises

organs controlled the interregional movement of goods, price differentials could easily be maintained. In a market economy, however, with atomistic private arbitragers hard at work, large interregional differentials in the prices of traded goods could only be maintained with barriers to trade. Thus, in the area of prices and the interregional movement of goods, the central regime's "reforms" ultimately degenerated, as they did in so many other areas, into a general devolution of power into the hands of provincial and sub-provincial governmental authorities.

By 1991, according to some estimates, somewhat less than one-third of enterprise transactions took place at centrally fixed prices [Gelb, Jefferson & Singh 1993]. Since centrally mandated price distortions are gradually disappearing, what force, one might wonder, serves to prevent local governments from reverting to free market principles? The answer to this question is as old as the history of protectionism itself: local governments now find their financial and political interests embedded in a particular industrial structure. These interests can be defended using a variety of mechanisms. In raw material producing areas, export barriers convert processing factories into monopsony buyers and, thereby, maintain the price distortions of the pre-reform era. Elsewhere, import barriers, while impoverishing the local economy as a whole, can induce artificially high returns in particular industrial sectors (just as in the import substitution industries of so many other countries). Finally, when trade barriers cannot be fruitfully enforced, or are viewed as being too costly to other local interests, there is always the banking system which can be repeatedly pressured into extending credit to enterprises, providing local revenue and employment at the expense of national inflation.<sup>20</sup> Thus, while it is probably the case that efficiency considerations, the demands of other social and political groups, and interregional

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were often undermined by localities and government departments, which simply imposed new controls.

20. On the ability of regional officials to force lending from branches of the state banking system and their successful resistance to attempts to centralize control of the banking system, see FEER, "At your service" (July 7 1994) and "Vital Signs" (March 30 1995).

competition for factors of production all place constraints on the distortionary activities of local governments, it is also not unreasonable to argue that there is considerable hysteresis in public finance and political relations. As the next section shows, many of the forceful trends of the 1980s, e.g. the duplication of industrial structure and the growing dispersion of prices, had, by the mid-1990s, come to a stop. They show, however, little tendency to reverse themselves.

### III. Data

While colorful anecdotes about interregional trade wars and complex descriptions of the precise pattern of arbitrage opportunities created by central policies make for interesting reading, in the context of China's economy, where policy switches back and forth, where contradictory policies coexist side-by-side and where, to confound everything, almost every policy is "adjusted" to suit local circumstances, they are hardly compelling. For every anecdote on interregional conflict, one can bring out five on growing interregional cooperation, and of course vice versa. Similarly, accounts of the distorted objectives and motivations of local governments easily become, when viewed through different lenses, fine examples of beneficial local intervention, helping entrepreneurial collective enterprises use their innate skills and resources to develop efficient and competitive industrial enterprises.<sup>21</sup> In this section I move beyond anecdotes and stories to the analysis of aggregate data.<sup>22</sup>

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21. As strange as it may seem to readers, it is not uncommon for different observers to hold completely opposite views on the meaning of almost any Chinese policy initiative, and even the general thrust of government policy. For example, Jefferson and Rawski [1994, p. 62] describe the 1992 State Council Regulations on Transforming the Management Mechanisms of State Owned Industrial Enterprises as part of "an unprecedented and virtually unrestrained push toward the market" during the 1990s. In contrast, Li [1996] views the 1990-1993 period as one in which government control was reasserted, seeing the Regulations, in particular, as part of a government attempt to "consolidate their strategic control rights over enterprises."

22. A complete description of the sources used for each part of the analysis is given in the Appendix, while the data themselves are available at my website [gsbwww.uchicago.edu/fac/alwyn.young](http://gsbwww.uchicago.edu/fac/alwyn.young).

## A. Outputs

Figure II below presents the sum of the absolute and squared deviations of the sectoral output shares of China's different provinces from the group average.<sup>23</sup> The longer time series, based upon the socialist measure of "national income", which excludes non-material sectors such as finance and government administration, divides output into five sectors: agriculture, industry, construction, transport and commerce. This series indicates a fairly stable degree of dispersion during the 1950s and 1960s, with a secular downward trend appearing around 1969, i.e. during the Cultural Revolution, when the central government promoted industrial diversification. Between 1969 and 1978 the sum of absolute deviations, panel (a), fell 18 percent. Surprisingly, during the reform period convergence continued apace, with the sum of absolute deviations falling an additional 16 percent from 1978 to 1992. The more conventional GDP series, which divides output into primary, secondary, and tertiary sectors, shows yet more convergence, with the sum of absolute deviations falling 25 percent by 1992. After 1992, the series flattens, attaining a minimum in 1993, but thereafter returning to the levels of 1992. As panel (b) shows, measures based upon the squared deviations from the average structure indicate even greater convergence, with the sum of squared deviations falling 39 percent between 1969 and 1978 (national income measure) and then a further 48 percent by 1997 (GDP measure).

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23. Specifically, the absolute and squared deviations equal

$$\sum_i \sum_j |S_{ij} - \bar{S}_j| \quad \sum_i \sum_j (S_{ij} - \bar{S}_j)^2,$$

respectively, where  $S_{ij}$  denotes the share of sector  $j$  in province  $i$ 's output and  $\bar{S}_j$  equals the average, across  $i$ , of  $S_{ij}$ . Since this cumulative measure is influenced by the number of sectors and provinces used in its construction, one should not make too much of the levels of the different series. The emphasis here is on trends, not levels.

As explained in the Appendix, China's provincial boundaries changed during the reform period. In general, I work with the 30 provincial level administrative (and statistical) divisions in place in 1996, adjusting the data as necessary to maintain consistent coverage. In regards to the national income measure in the Figure, data on Tibet and Hainan do not extend back before 1979. Hence, that measure is based on only 28 provinces. Tibet and Hainan accounted for only 0.8 percent of provincial national income in 1992 (China Statistical Yearbook 1993, table 2-17).

To establish the robustness of the preceding results, Table II modifies and decomposes Figure II's analysis of the convergence in the structure of production. I compute, separately, the sum of deviations from the provincial average structure and from the national structure (in effect, the output weighted provincial average structure). As in Figure II, I compute the unweighted sum of absolute and squared deviations, but also consider a weighting of each deviation by the province's share of total GDP.<sup>24</sup> Finally, I decompose the sum of deviations into those of the coastal provinces, and those of the interior.<sup>25</sup> As the reader can see, the weighted measures show somewhat more convergence, indicating that the larger provinces moved more rapidly to the average structure. Beyond that, the use of either the provincial average or national structure as the benchmark has little effect on the results, while a breakdown of the deviations into the contributions of the coastal and interior provinces indicates that convergence was widespread, i.e. the sum of deviations fell substantially for both groups, with the relative strength of the effect depending upon the measure examined.

Figure III below graphs the shares of primary, secondary and tertiary industry in the GDP of each province in 1978 against the corresponding share in 1997, providing a more immediate visual illustration of the convergence in the composition of output during the reform period. Panel (b) shows the enormous compression in the variation in the share of secondary industry (mining, manufacturing, construction and utilities) between 1978 and 1997. As highlighted by the 45 degree line, provinces with high initial secondary shares witnessed a dramatic decline in

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24. Thus, the sum of absolute weighted deviations from the national structure is given by

$$\sum_i \sum_j 30 * w_i | S_{ij} - S_j |,$$

where  $w_i$  denotes the province's share of total provincial GDP, the 30 adjusts for the fact that the average weight is 1/30, and  $S_j = \sum_i w_i S_{ij}$ .

25. The coastal provinces are Tianjin, Hebei, Liaoning, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong, Guangxi, and Hainan. Together, these provinces accounted for 49 percent of provincial GDP in 1978 and 56 percent in 1997. Jilin touches the coast on a small strip of land just north of Korea, but I do count it as a "coastal" province.

the share of that sector, while provinces with low initial shares generally experienced a rise in its contribution to GDP. Excluding the two outliers in the lower left hand corner of the figure (Hainan and Tibet), the range of variation in the share of secondary industry went from between 34 percent and 77 percent in 1978 to between 37 percent and 54 percent in 1997. As regards primary industry (agriculture, forestry and fishing), panel (a), most provinces saw a decline in the share of that sector but the overall distribution was compressed as by far the largest reductions occurred in those provinces with high initial shares. Finally, as shown in panel (c), all provinces increased the share of services in total production and, due to the appearance of outliers such as Beijing and Shanghai, the degree of dispersion rose. The disproportionate growth of service output in the urban centres most likely reflects the fact that both the development and measurement<sup>26</sup> of this natural urban activity were neglected under socialist planning.

It is important to distinguish between convergence in the composition of output, which is predicted by a rise in interregional trade barriers, and convergence in absolute levels of output, which is not. Figure IV graphs the standard deviation of the provincial GDPs per capita of primary, secondary and tertiary industry.<sup>27</sup> As the Figure shows, while the variation of output per capita of secondary industry has fallen steadily, this is not true for primary and tertiary output. In particular, despite the convergence in the shares of primary industry (Figure III above), the standard deviation of output per capita of primary products actually increased 37 percent

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26. Since most services involved "non-material production", they were not measured in the socialist concepts of National Income or Total Product of Society. The 1991-1992 Census of Services led to an upward revision, of about 30 percent, in the estimated volume of service activity. In the national and provincial statistical series, it was assumed that virtually all of this (previously unmeasured) activity had developed since 1978 (compare, for example, China Statistical Yearbook 1994 and 1995, table 2-10). It seems likely, however, that some of the newly discovered output existed prior to the reform era.

27. The outputs in Figure IV, as well as those used in Figures II and III and in Table II, are computed in nominal prices. Although I have collected data on interregional prices in China (see the next Section), I lack the heroism necessary to convert these into regional PPP deflators. The variation of the ln outputs per capita or the composition of output computed in constant prices (of either 1978 or 1997) exhibits trends similar to those depicted in the Figures above.

between 1978 and 1997. Trade barriers tend to lower the internal prices and real outputs of products in which a region has a comparative advantage. This leads to a convergence in the nominal output shares of different sectors. The impact of this convergence in structure on the variation of output per capita is, however, ambiguous and depends upon the correlation between patterns of comparative and absolute advantage. For example, consider a poor region, with an absolute disadvantage in both agriculture and industry, and a comparative advantage in the former. With the imposition of barriers to trade, the region's output of industrial products will rise, while its output per capita of agricultural products, already below the national average, will fall. This will decrease the interregional variation of industrial output per capita, while increasing the variation of agricultural output per capita. Furthermore, putting aside trade barriers, the evolution of patterns of absolute advantage during the reform period will have influenced the interregional dispersion of absolute output levels. The imposition of trade barriers has clear implications for the interregional variation in output shares; it has no prediction regarding the variation in the absolute output levels.

## B. Prices

Ceteris paribus, trade barriers, which segment markets, will increase the variation of prices across those markets. Consequently, in this section I examine time trends in the standard deviation of the ln of regional goods prices.

While price indices for the different regions of the Chinese economy are widely published and easily available, data on the actual prices of goods are more sparse and problematic. Using public sources, I have been able to collect four different data sets on regional prices, specifically: (1) Annual data on the retail prices of 305 consumer goods in 30 cities for the period 1986-1993; (2) Annual data on the prices of 130 agricultural goods purchased by commercial establishments in the 30 provinces during the period 1986-1993; (3) Monthly data on the market prices of 49 industrial materials in 36 cities for the period 3/90 to 5/99; and (4) Monthly data on the market prices of 33 agricultural products in 36 cities for the period 6/93 to 5/99. While the figures listed above outline the full range of products and locations covered by the data, it is important to note that there are numerous gaps. Products enter and leave the published series, while numerous cities/provinces report no data, and the locales omitted in this fashion vary from product to product and period to period.<sup>28</sup> The annual data form the basis of the decades old retail price and farm products purchasing price indices. While the reported locales are fairly stable, the number of products present varies considerably. Overwhelmed by the number of new products appearing in the economy, the State Statistical Bureau completely abandoned the collection of this data in 1994.<sup>29</sup> The monthly price data represent a new effort, begun at the turn of the decade, by the China Price Information Centre, a division of the Planning Committee. There is little change

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28. All of which provides some insight into what lies behind the ubiquitous price indices.

29. However, the various price indices continued to be published. According to officials at the SSB (personal communication), each locale was instructed to compile the index in the manner it saw fit and report to the SSB, which would then combine the local price indices to form the published series.

over time in the reported products, but there is great (although seemingly random) month to month variation in the reporting cities. Table III summarizes the characteristics of the different series.

I take the simplest approach to the analysis of these unbalanced panels, regressing the ln of the standard deviation of the ln prices of each product in each time period on a complete set of product and time dummies, using the repeated observations of the product standard deviations to infer trends in the overall dispersion of prices.<sup>30</sup> In Figure V I report the value of the time dummies, relative to a base period of zero. Panels (a) and (b) examine the dispersion of the annual data, using 1986 as the base period. As the Figure shows, the dispersion of both retail and agricultural prices rose rapidly between 1986 and 1989, after which it fell, and then rose again. Overall, there was a highly significant positive time trend in retail price dispersion of about 2.4 percent per annum ( $t=8.0$ ) and a somewhat weaker, albeit still significant ( $t=2.1$ ), positive trend of 1.4 percent per annum in the dispersion of agricultural prices. Panels (c) and (d) extend the analysis to the monthly data, taking as the base period 6/93, the initial period of the agricultural market price data and approximately the endpoint of the annual estimates in panels (a) and (b). As the reader can see, the monthly price data have gone through bouts of falling and rising dispersion. These fluctuations mirror the patterns in the overlapping period of the annual data, with a reduction in dispersion in 1990-1991 followed by rising dispersion in 1991-1993, but the

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30. In essence, I ignore the variation in the locales used to compute each standard deviation, under the assumption that they vary randomly. I have experimented with other approaches. For example, I construct a chained balanced panel by taking paired observations on locales in adjacent periods. Taking each group of pairs (representing observations on the prices of a product in common locales in two adjacent periods) as a "product", I then regress the ln standard deviations on time dummies and a full set of "product" dummies. The movements of the time dummies are similar, although, given the chain, the standard errors explode as one moves away from the base period. In another approach, I regress the ln of the squared residuals from a regression of ln prices on time x product dummies (i.e. deviations from time x product means) on sets of product, time *and* locale dummies, to search for time related patterns of heteroskedasticity (adjusted for locale specific heteroskedasticity). This approach is not without its problems (see Green 1993, p. 400), as the time x product means depend upon the locales present in each period. In any case, the results are once again similar.

movements are considerably grosser, with the mean monthly industrial materials price dispersion rising 23 percent from 1991 to 1993. These bouts of falling and rising dispersion are consistent with trade wars which are periodically interrupted and suppressed by the central government, only to resume once again, when central attention focuses on other matters.<sup>31</sup> In any case, regardless of the interpretation, there is no indication of any trend toward reduced price dispersion in the 1990s.<sup>32</sup>

To summarize, the quality of Chinese price data is extremely poor. The data, such as they are, indicate a rise in dispersion during the late 1980s. During the 1990s, price dispersion has waxed and waned, but shows no clear tendency to reverse the increases of the previous decade.

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31. These fluctuations in price dispersion do not appear to be driven by variation in the locales present in the data. As noted in the footnote above, when I construct a chained balanced sample, or estimate time series heteroskedasticity with controls for locale specific heteroskedasticity, I get similar results. If anything, the magnitude of the fluctuations is substantially greater. For example, in the chained balanced sample the mean monthly standard deviation of industrial materials prices rises 72 percent (!) between 1991 and 1993.

Alternatively, one might worry that the fluctuations are driven by changes in the overall rate of price inflation. To this end, I have used balanced sample locale pairs to construct period by period estimates of the rate of inflation in each product, and found that product inflation during the period has either an insignificant, or a significantly negative, effect on price dispersion. In any case, the estimated pattern of fluctuations is, once again, largely unaffected.

Finally, I should also note that it is unlikely that measurement error explains these fluctuations. Measurement error is included in the estimates of the standard deviation of  $\ln$  prices. For it to generate the pattern in the Figure, it would be necessary that the quantity of measurement error cycled up and down, in a serially correlated fashion. The only information I have on this is that, according to officials in the Price Information Centre, with the introduction of computer coding in the past two years they have made attempts to weed out errors, e.g. asking for confirmation of numbers which deviate excessively from figures reported in earlier months. Yet, during 1998 and 1999 the estimated standard deviations rose rapidly, as part of a new upswing.

32. Actually, the industrial materials price standard deviations have a significant positive trend (.09 percent per month), while the agricultural market price standard deviations have a significant negative trend (-.2 percent per month), but anyone glancing at the sinusoidal pattern of the monthly dummies in Figure V can see that these coefficients might easily be eliminated with the addition of a few more months of data.

### C. Alternatives and a Variance Decomposition

While evidence of a convergence in the structure of production and some divergence of prices is consistent with an increase in interregional trade barriers, it is also consistent with a variety of other hypotheses. One might argue that the factor endowments and relative productivities of China's diverse provinces appear quite dissimilar when viewed in isolation, but surprisingly homogeneous when contrasted with the rest of the world. If so, then when China was a closed economy its provinces would have specialized in different sectors, but once China opened to the international market each province would naturally find its comparative advantage in a common industrial structure. Alternatively, it is possible that interregional patterns of comparative advantage converged during the reform period and that this, without any appeal to internal trade barriers or the opening to the international market, explains the convergence in the composition of output. Regarding the divergence of prices during the late 1980s, if the reform period has seen a growth of product variety, with different provinces specializing in different varieties, then, absent any change in interregional price arbitrage, this would naturally lead to growing price dispersion within product categories. Further, with increased regional specialization within product categories, temporary economic shocks might have uneven effects across localities, generating the bouts of converging and diverging prices observed during the 1990s.

A simple variance decomposition answers some, albeit not all, of the counterarguments listed above. In Table IV below I decompose the interregional variance of the relative output of primary to secondary industry, two predominantly tradeable sectors,<sup>33</sup> into the variance of labour productivities, the variance of labour allocations, and the covariance between the two. As the reader can see, during the reform period the interregional variance across 28 of China's prov-

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33. In Chinese data, primary industry includes agriculture, forestry and fishing, while secondary industry includes mining, manufacturing, construction and utilities. In producing the calculations for the United States (using the BEA data described in the Appendix), I construct sectoral aggregates using the Chinese definitions.

inces of the ln relative output of primary to secondary industry went down. Surprisingly, during the same period the variance of provincial relative labour productivities and labour allocations both rose. In other words, while China's provinces became more similar in terms of the composition of final output, they became increasingly *dissimilar* in terms of sectoral productivities and sectoral labour allocations, with the decline in the variance of outputs only appearing as a consequence of the development of a strong negative covariance between productivities and factor allocations. If the convergence in the composition of output across China's provinces is driven by a convergence in patterns of comparative advantage, then one should observe a growing similarity of labour allocations and productivities (i.e. the economies should be increasingly similar on all dimensions). Similarly, common specialization driven by the opening to the international market should be accompanied by a growing similarity of labour allocations. None of this is present in the data.

For contrast, Table IV also presents a variance decomposition of the regional output of the United States, and a longer time series for a subset of Chinese provinces. Between 1977 and 1994 the variance of the relative output of primary to secondary industry across U.S. states fell rapidly. Unlike China, however, in the United States this convergence was associated with a large decline in the variance of labour allocations. Examining a longer time series for 14 provinces of the People's Republic,<sup>34</sup> between 1952 and 1965 we observe rapid convergence in the structure of production driven by a substantial decline in the variance of labour productivities and labour allocations. During the period 1965-1978, when central policy, and the chaos of the Cultural Revolution, encouraged regional industrial duplication, the convergence of outputs continued, but the mechanism changed, as the decline in the variance of relative outputs came from a deterioration of the covariance between productivities and allocations. This transformation of the mechanism behind productive convergence reached fruition during the reform period

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34. Together, these provinces accounted for 52% of provincial GDP in 1978.

(1978-1997) when, in this sample, as in the aggregate economy, the variance of productivities and allocations grew, while their covariance continued to deteriorate.

In sum, the convergence in the structure of production observed in U.S. states in recent decades and in Chinese provinces in the early postwar era is quite consistent with explanations that emphasize either increasing integration into the international market or a convergence in patterns of comparative advantage. However, the continued convergence of the Chinese economy during, first, the Cultural Revolution and, then, the reform period is not consistent with such explanations. The later Chinese data are, however, compatible with a rise in trade barriers. A growing diversity of nominal labour productivities could easily arise from growing interregional price disparities, which would increase both the variation of relative prices and, due to a decline in factor price equalization, the variation of relative real labour productivities. A rise in the variance of labour allocations could come from increasingly perverse labour allocations, as provinces poured resources into areas of comparative disadvantage, a view which would also not be incompatible with the growing negative correlation between productivities and factor allocations.<sup>35</sup>

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35. As noted first by Ford [1967] and, then, Falvey [1981], trade barriers tend to raise the relative productivity of labour in industries in which an economy has a comparative advantage. This result holds whether the source of comparative advantage is aggregate relative factor supplies (capital and labour), the supply of sector specific capital (with labour mobile between sectors), or sector specific total factor productivity. Further, while the imposition of trade barriers should, starting from free trade, lead to a diminishing variation of factor (labour) allocations, once factor allocations become perverse (i.e. if regions concentrate factors within sectors of comparative disadvantage), further impediments to trade will lead to a growing interregional variation of factor allocations. Consequently, one could interpret the rising variances and deteriorating covariances in Table IV as evidence of increasing trade barriers.

The preceding argument, however, is not quite correct. First, one can show that in a two-by-two Heckscher-Ohlin framework in which, say, all economies have the same capital-labour ratios but have different relative sectoral total factor productivities, if the elasticity of substitution between capital and labour is greater than one then under free trade labour productivity will actually be lower in the industry in which the economy has a comparative advantage. Since trade barriers tend to raise relative labour productivity in the industry in which the economy has a comparative advantage (the Ford-Falvey result), it follows that, starting from a point of free trade, a rise in trade barriers will, at least initially, lead to a decrease in the interregional variation of relative labour productivities.

Second, and perhaps more importantly, the Ford-Falvey analysis is based upon real pro-

At this point, a critic might observe that the preceding discussion, including the counterarguments that motivated this section, is all based upon the analysis of a free market economy moving from one state to another as a consequence of a change in an underlying "exogenous" variable, i.e. patterns of comparative advantage, openness to the world, or interprovincial trade barriers. However, the Chinese economy in 1978 was a distorted, centrally-planned construct. As such, there is no sensible way to use the customary comparative statics of trade theory to understand its evolution since then, whether that evolution has been toward a free market (the conventional view) or distortionary local planning (the view of this paper). In other words, an adamant skeptic might simply argue that all of the preceding data on outputs, prices, labour productivities and factor allocations is, for an appropriately complex set of initial centrally planned distortions, perfectly compatible with a movement to the free market.

In this paper I have shown that during the reform period interregional outputs converged and interregional prices diverged (or, at least, fluctuated wildly). These data are compatible with a rise in interregional trade barriers. They are also somewhat at odds with a movement to market, given the conventional view that, historically, Chinese central planning led to excessive interregional duplication of industries. To establish the argument, however, I need to present

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ductivities. As highlighted by the price terms in the column headings of Table IV, my data concern nominal productivities, i.e. real productivities multiplied by prices. Since prices tend to be lower in products in which a region has a comparative advantage, in nominal terms the Ford-Falvey analysis can be reversed, i.e. in the presence of barriers to trade a region might actually have a comparative advantage in products with lower relative nominal productivities. Consequently, all one can say is that the data in the Table are compatible with a rise in trade barriers, i.e. they are one, of many possible, configurations (they are, however, regardless of elasticities of substitution or prices, quite incompatible with a convergence in patterns of comparative advantage or the movement of factors in response to an opening to the world market).

For what its worth, the analysis in constant prices, of either 1978 or 1997, looks much the same. This, however, is not a perfect solution, as there is still the problem of the base year prices and their correlation with patterns of comparative advantage. In any case, as I discuss in the text, it is somewhat fanciful to use the traditional constructs of trade theory to understand the transition from distorted central planning. Consequently, rather than pursue the Ford-Falvey emphasis on relative labour productivities, in the next section I develop direct measures of comparative advantage, showing that factor allocations are, indeed, becoming increasingly perverse.

evidence of a movement of factor allocations away from patterns of comparative advantage, i.e. of an increasingly distorted interregional allocation of factors. Ideally, such evidence should be uncontaminated by potentially distorted price measures. Further, the measure of comparative advantage, and the interpretation of the results as a movement toward regional autarky, should be invariant with respect to the economic regime, be it central planning, local planning or free market. To this end, in the next section I turn to the analysis of agricultural yields, factor allocations and the weather.

## D. Agriculture and the Weather

Panel (a) in Figure VI below plots the average yield of land sown with grain against the overall labour intensity of agricultural production in 27 Chinese provinces in 1978.<sup>36</sup> The typical economist would not find the positive association depicted in the Figure surprising. The greater the quantity of inputs applied per hectare of agricultural land, the greater should be the yield per unit of that land. With grain, the principal agricultural product, accounting for the lion's share of hectares sown, it is not surprising that the yield of land sown with grain rises with the overall labour intensity of agricultural activity in a province.<sup>37</sup> Unfortunately, by 1997, as shown in panel (b), this "natural" positive association had completely disappeared. This development forces one to reexamine the logic of panel (a).

A positive association between labour per hectare and yield per hectare might reflect causality running from the x axis to the y axis, but it can also reflect causality running from the y axis to the x axis. If one thinks of all provinces as having the same agricultural "technology", then the causality runs exclusively from x to y, as greater labour inputs per hectare result in greater yields per hectare. However, there are likely to be substantial differences across prov-

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36. Following the data I will use in Table V below, I use the 29 provincial-level administrative divisions in place in 1985, including Hainan under Guangdong and Chongqing under Sichuan. With data on primary employment in Tianjin and Zhejiang in 1978 unavailable, this leaves the 27 provinces depicted in the Figure.

37. In 1978 grain accounted for 80% of total hectares sown. In 1997 the share of grain was 73%. Within grain, the shares of rice, wheat, corn and tubers in total hectares sown was 29%, 24%, 17% and 10%, respectively, in 1978, and 28%, 27%, 21% and 9%, respectively, in 1997. It is hard to believe that these small changes in the overall role of grain and its composition account for the results which follow. (All data from the China Statistical Yearbook).

More problematic, perhaps, is my use of the labour in primary industry (not, I should emphasize, the rural labour force, which includes labour engaged in non-primary activities) as a measure of the labour devoted to the cultivation of land. It is possible that an increasing share of primary sector labour is devoted to non-farming activities, e.g. forestry, animal husbandry and fishing. I should note, however, that in the analysis below (Table V) I use direct measures of inputs which are more exclusive to farming, e.g. irrigation and chemical fertilizers. The evolving relationship between these factors and measures of comparative advantage, which will be my main emphasis, is the same as that of primary labour.

inces, with some locales having land and weather conditions more suitable to the cultivation of grain and agricultural products in general. These provinces, endowed with a superior "technology", will have more productive land, raising the marginal product of labour on that land and drawing labour into the sector. In this case, the causality will run both from  $x$  to  $y$  and from  $y$  to  $x$ , as greater yields lead to a greater labour intensity of production.

To explain the orthogonality between factor intensities and yields apparent in panel (b), one merely has to pervert the causality running from yields to factor intensities by, say, introducing interregional barriers to trade. With barriers to trade, the tendency for factors to flow into more productive sectors can be weakened and, possibly, reversed. In a free market economy, provinces with better agricultural yields would experience a decline in the price of grain, which would reverse the flow of factors of production into that sector. In China, with the enduring national and local controls over the price of grain, price mechanisms such as this are unlikely to be at play. Nevertheless, the quantity restrictions implied by price controls and local procurement plans will generate the same effect, as in provinces with productive land, farm labour, faced with limited internal demand, migrates into industrial activity. Evidence in favour of a reversal of the link between yields and factor intensities is given by panel (c) of Figure VI, which shows that the provinces with the most productive agricultural sectors in 1978 were the ones that, relative to the mean change, experienced the greatest declines in the labour intensity of agricultural production. With a sufficient perversion of the causality running from yields to factor intensities ( $y$  to  $x$ ), one can overcome the natural relation between factor intensities and yields ( $x$  to  $y$ ), producing the orthogonal cloud of panel (b) in Figure VI.

To support the preceding argument about perverse allocations, one would like to have a measure of the suitability of different regions for agricultural production and show that factor allocations have moved against that measure. Ideally, the measure should be time invariant, uninfluenced by all of the remarkable changes in regional comparative advantage that, most surely, have accompanied 20 years of reform and growth. As such a measure, I choose: the

weather. In Table V below I regress a panel of provincial grain yields during the period 1985 to 1997 on various measures of agricultural factor inputs and rainfall, with provincial dummies to control for mean effects on yields. Turning, first, to the weather, I find that grain yields rise with moderate (but not excessive) quantities of rainfall, and are negatively related to the monthly variation in that rainfall. This seems completely intuitive. Turning to the measures of other inputs, I find that grain yields rise with the share of agricultural land which is irrigated, and with the application of fertilizer. However, the total power of agricultural machinery and quantity of labour per hectare of agricultural land have no significant impact on yields. These results mirror panel (b) of Figure VI.<sup>38</sup> I interpret them as reflecting the negative response of these factor allocations to omitted variables which, from year to year, favour yields in one region or another.

Using the coefficients from my regression of yields on rainfall, I derive a synthetic measure of provincial weather-dependent comparative advantage in agriculture ("weather") as the mean annual value of the combined effects of precipitation, precipitation squared and the variation of precipitation.<sup>39</sup> In columns (2) through (7) I then regress various measures of factor inputs on this measure interacted with time ("Wtime"). With provincial dummies included in the regression (as in the upper panel of the Table), the coefficient on Wtime indicates the association

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38. I should emphasize that, because of the absence of weather data for earlier years, the analysis in the Table begins in 1985. By that time, the relation between labour intensity and yields had already begun to deteriorate.

39. Strictly speaking, this is a measure of absolute advantage. However, if absolute advantage in the non-agricultural segments of the economy is orthogonal to the weather, as it plausibly might be, then, subject to random error, "weather" is a measure of comparative advantage as well.

between the provincial trends of the dependent variable and the favourableness of the weather.<sup>40</sup> As the Table indicates, over time provinces with better weather withdrew factors of production from agriculture. The coefficients on the application of irrigation, fertilizer, power (machinery) and labour are all highly significantly negative, as is the coefficient on the share of the labour force in agriculture. The output per capita of grain products also moved against patterns of comparative advantage (column 7). The magnitude of the coefficients indicate that a standard deviation increase in the value of weather (.026) was associated with about 1 percent per annum slower growth in the application of fertilizer and in the output of grains per capita, and about 1/2 percent per annum slower growth in the application of irrigation, power and labour. Excluding Wtime from the regression, one finds that the mean provincial trend growth of irrigation, fertilizer, power, labour and output per capita was 1.0, 7.0, 4.2, 0.0, and 1.0 percent per annum, respectively. With regards to the share of the labour force in agriculture, the only variable not measured in lns, a standard deviation increase in the favourableness of the weather was associated with a .2 percent faster decline in the labour share, or a 2.4 percent fall over the entire sample period. During the same period, the mean provincial share of labour in agriculture fell from .59 to .49. In sum, the effects are both statistically and empirically significant.

As a test of robustness, in the lower panel of Table V I run the same regressions without provincial dummies, including both the mean value of the weather and its interaction with time. Without provincial dummies, the regressions in columns (2) through (7) no longer examine the provincial trends in the dependent variable, but instead indicate the trend in the cross sectional association between the level of the dependent variable and the quality of provincial weather.

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40. To see this, write the regression as:

$$(1) Y_{it} = B_t t + B_w W_i^* t + \alpha_i + \varepsilon_{it}$$

where Y represents the dependent variable, W is my measure of comparative advantage, the  $\alpha$ 's are the provincial dummies, i denotes the province and t (running from 0 to T) time. Partialing out the provincial dummies, one finds that:

$$(2) Y_{it} - \bar{Y}_i = B_t(t - T/2) + B_w W_i^*(t - T/2) + \varepsilon_{it}$$

On the face of it, the results now appear considerably weaker, as most of the coefficients on Wtime are insignificant. However, as the reader can see, the coefficients on Wtime are actually identical to those in the upper panel. In a balanced panel, the orthogonalization of an observational unit mean interacted with time, i.e. a variable such as Wtime, with respect to either unit dummies or the observational unit mean itself yields the exact same residuals as independent regressors.<sup>41</sup> Consequently, the only reason why the coefficients on Wtime are insignificant in the lower panel is because, without provincial dummies, the fit of the regression worsens considerably, leading to the conclusion that there is considerably more "error" variance in the dependent variable and, consequently, much less confidence in any parameter estimate. It seems reasonable to recognize that the mean provincial value of the dependent variables in columns (2) - (7) might vary for reasons other than the weather, and that provincial dummies are an acceptable means of controlling for such effects. Nevertheless, I include the results in the lower panel to show the reader how the results I have emphasized can be weakened.

Column (8) of Table V reruns the regression of column (1) with Wtime instead of the annual weather variables. As this column shows, relative to average trends, provinces with good weather experienced declining yields. This result is not particularly surprising. As columns (2) - (6) showed, the trend growth of all of the factor inputs I have measured has varied negatively with the quality of the weather. It seems likely that this negative correlation extends to other, unmeasured, complementary inputs. If so, the estimated impact of the weather on yields would diminish over time. Column (8) does, however, highlight the weaknesses of the methodology I

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41. In other words, after partialing out the effect of  $W_i$ , the right-hand side variables are the same as in the preceding footnote. The left-hand side variable, of course, is different, but the additional variation is only across  $i$  categories (the  $t$  dimension variation within each  $i$  category is unchanged). As the only variation of the orthogonalized right-hand side variables is across  $t$  (their mean, within each  $i$  category, is zero), the coefficients are unchanged. I should note that the regressions in column (4) are unbalanced (I am missing an observation on power for one province), and hence the coefficients differ slightly between the upper and lower panels of the Table.

have pursued. Omitted factor inputs bias the coefficients on rainfall, while omitted measures of comparative advantage bias the coefficients on other factor inputs (e.g. power and labour), thereby further distorting the coefficients on rainfall. Consequently, my synthetic measure of the "weather" is subject to considerable error and bias. As a sensitivity test, I have reestimated column (1) using the data for 1985 alone or using the data for 1985-1989, and the results (for the whole table) are much the same. I have no means, with the data at my disposal, to even begin to address problems of endogeneity and bias, but the results do not seem sensitive to reasonable re-specifications.

As a final defence, the unrepentent skeptic might reinterpret the preceding results as merely showing that Chinese agricultural production during the reform period has become less dependent upon the weather, the simple manifestation of technological progress that has undermined historical sources of comparative advantage in agriculture. Denied the possibility that even the weather has remained an enduring source of comparative advantage in agriculture, I am forced to return to the simple correlations that motivated the analysis of Table V. Figure VII below graphs the relationship between grain yields and the labour intensity of agricultural production in 15 Chinese provinces across the entire post-war era.<sup>42</sup> As the Figure shows, from 1952 to 1978 there was, consistently, a significant positive correlation between these two variables. By 1997 that correlation was gone. For almost thirty years, with all of the excesses and inefficiencies of central planning, there existed a completely sensible relation between labour inputs and land yields. During the reform period's "movement to market", this relation disappeared. It is difficult to argue that the complete elimination of a correlation between factor intensities and yields is consistent with the rationalization of production and factor allocations in

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42. The 15 provinces are Inner Mongolia, Liaoning, Jilin, Heilongjiang, Shanghai, Anhui, Jiangxi, Henan, Hunan, Sichuan, Guizhou, Yunnan, Qinghai, Ningxia and Xinjiang. Together, these provinces accounted for 51.5% of grain output in 1978.

response to market incentives. It is quite consistent, however, with an economy where the regional structure of production, through local bureaucratic control, has been distorted away from patterns of comparative advantage, be these founded in the weather, or other sources.

#### IV. Conclusion

The central proposition of this paper is, seemingly, unbelievable. One is asked to accept that 20 years of economic reform in the People's Republic, which have brought extraordinary economic growth and burgeoning international openness, have resulted in a fragmented internal market with fiefdoms controlled by local officials whose economic and political ties to protected industry resemble those of the Latin American economies of past decades. It seems plausible that the endogenous response of actors to the rent seeking opportunities created by gradualist reform could give rise to new distortions, whose lifespan far exceeds that of the rents which motivated their arrival. Nevertheless, it seems hard to believe that this paper, drawing its inspiration from a broad reading of popular Chinese media, has hit upon a creditable example.

The central proposition of this paper is, surprisingly, supported by a wide variety of data. Anecdotal stories of industrial duplication are supported by data on the structure of GDP, which show widespread convergence in the structure of production during the reform period, despite what is reputed to have already been extensive, and presumably excess, diversification under the plan. The interregional variation of prices rose during the 1980s, and then fluctuated wildly during the 1990s, patterns compatible with anecdotes of interregional trade wars that are periodically suppressed by central intervention. While regional relative outputs have converged, regional relative factor allocations and labour productivities have, bizarrely, diverged, which undermines attempts to explain the output movements as driven by free market forces and patterns of comparative advantage. Finally, the natural link between labour intensity and agricultural yields, present even under central planning, completely vanishes during the reform period, while the correlation between agricultural factor allocations and the quality of the weather weakens as provinces with better weather conditions shed factors of production. Although individual pieces of this evidence can be explained away, in their totality, they are difficult to dismiss. There is every indication that the economy of the People's Republic, while opening up

internationally, has become fragmented internally.

Fundamentally, this paper argues that the so-called "liberalization" and "transformation" of the People's Republic over the past 20 years is perhaps best characterized as a process of devolution. Although the central government has released control over prices, outputs and enterprise budgets, these functions have been taken up, albeit in a less systematic fashion, by local governments. Thus, China has moved from having one central plan to having many, mutually competitive, central plans. It is not hard to believe that the control and incentive problems that plague planning are more easily managed at the provincial and county level than they are at the continental level. Consequently, whatever the welfare costs of the new distortions, it is not surprising that on *net* the devolution of power has greatly increased welfare, as witnessed by the extraordinary growth of the past two decades.<sup>43</sup> An economic system characterized by government control, even local government control, over prices, output and investment is not, however, typically viewed as being conducive to long term prosperity. It remains to be seen whether the central government of the People's Republic can wrest back enough power from its

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43. Surprisingly, it is actually possible to argue that overall improvements in efficiency during the reform period have not been that high. The Chinese national accounts are somewhat unusual in that the statistical authorities depend upon firms to report both the nominal and real, i.e. inflation adjusted, value of output. As noted by Ruoan [1995] and Woo [1995] it is likely that most enterprises do not make proper adjustments for inflation. The Chinese statistical authorities do, however, separately collect price statistics. If one uses these price indices to deflate the nominal value of output, non-agricultural GDP growth during the reform period is found to be about 2.5 percent slower per annum than officially reported. Crude total factor productivity calculations then suggest that, taking into account rising participation rates, improved educational levels and the transfer of labour out of agriculture, total factor productivity growth in the non-agricultural economy during the reform period has been about 1.4 percent per annum; respectable, but by no means as extraordinary and unprecedented as the output growth reported in official statistics. Thus, it is possible that the reforms, and local government control, while expediting a movement of (possibly slack) resources out of agriculture and continuing to encourage valuable investment in physical and human capital, have not been especially successful in raising the efficiency with which resources are used in the non-agricultural sector. This conclusion, however, depends upon the adjustment of the Chinese output deflators. If one accepts the official reported deflators, then post reform TFP growth in the non-agricultural sector is spectacular, i.e. at least 3 percent per annum for 20 years. These calculations are discussed further in Young [2000].

regions, enforcing the moral equivalent of the interstate commerce clause of the U.S. Constitution, restricting the power of local governments to control the interregional movement of goods and factors, without, however, reestablishing inefficient central control over the same. This would allow it to bring out the most virtuous aspects of interregional local government competition, while restricting its more pernicious manifestations.

## V. Appendix: Sources

Table I and Figure I: In Chinese data, government revenue by sector is computed net of enterprise losses. Historically, price subsidies were counted as negative revenue, while debt issues and payments were counted as part of revenue and expenditure, respectively. Price subsidies were shifted from revenue to expenditure in 1986. Beginning in 1994, debt and interest were no longer included under revenue and expenditure. Further, in that year all capital construction financed by foreign borrowing was removed from expenditure. Using the data on various budgetary items in the China Statistical Yearbook and the China Public Finance Yearbook I construct a consistent series, which underlies the data in Table I and Figure I, using the following definitions: (1) price subsidies are counted as part of expenditure, not negative revenue; (2) debt issues and interest payments are excluded from revenue and expenditure (I could not separate out interest payments alone); (3) capital formation financed by foreign borrowing is included in expenditure; and (4) revenue by sector continues to be computed net of enterprise losses.

An important issue is the treatment of "extra-budgetary" revenue, which grew from 31 percent of revenue in 1978 (using my series, which matches the most recent official definition of revenue) to 111 percent in 1992. Until 1992 the definition of extra-budgetary revenue included the various surcharges and levies raised by government departments as well as the many funds retained by enterprises but earmarked for specific use, e.g. welfare, bonus, and capital construction and technical updating funds. Although local governments tap these funds [Wong 1991a], it seems excessive to consider the full value of these funds as being under government budgetary control. In 1993 Chinese statistics stopped counting the funds of state-owned enterprises and agencies as part of extra-budgetary revenue, lowering extra-budgetary revenue to 33 percent of the value of budgetary revenue in that year. In any case, since I have not been able to find data on extra-budgetary funds by sector of origin or an historical breakdown of non-state enterprise extra-budgetary funds into local and central categories, I do not include extra-budgetary funds in the analysis of Table I and Figure I.

I should note that extra-budgetary funds are not the sole problem with Chinese budgetary data. While villages have no formal budgetary authority (and are not counted in the consolidated budget), they have developed their own revenues and expenditures [Wong 1997, pp. 198-199]. At the same time, other levels of government have shifted both personnel and capital expenditures off-budget [Wong et al 1995, pp. 129-130]. In sum, it is clear that during the reform period the official budgetary data account for an increasingly small share of total public finance. However, trends during the reform period are not my emphasis. I use the data in Table I and Figure I merely to establish the important revenue role of industry at the beginning of the reforms and emphasize the meaningless character of distinctions between "local" and "central" revenue in a system where virtually all revenue was collected by local authorities.

Table II and Figures II, III and IV: Each province in China publishes a statistical yearbook. The data on provincial GDP by sector come from the annual issues of these yearbooks. National income by sector is compiled from the Hsueh, Li and Liu [1993], A Compilation of Historical Statistics (State Statistical Bureau 1990) and the annual issues of the China Statistical Yearbook.

I should note that until 1988 China was divided administratively into 29 provinces, provincial level cities and autonomous territories. In 1988 Hainan, formerly a part of Guangdong, became a separate province, while in 1997 Chongqing city was removed from Sichuan. Revised historical data separating Hainan and Guangdong are generally available, although similar data separating Chongqing from Sichuan are not. So, to maintain consistency, I add Chongqing back into Sichuan in 1997, but otherwise work with the 30 provincial boundaries in place in 1996.

Table III and Figure V: The annual data come from the 1988-1992 and 1994 issues of China Price Statistics Yearbook (the publication does not appear to have been produced in 1993), while the monthly data come from the 4/90 through 6/99 issues of China Price (magazine). Each issue of the Price Statistics Yearbook provides data on the current and previous year, so the data overlap from publication year to publication year. Since many locales frequently go unreported, but these vary from year to year, I construct the largest possible data set by taking the union of the overlapping yearbooks, treating the most recent publication as more accurate in cases where the two publications provide inconsistent data on the same locale. The precise grade of product reported for each locale (e.g. first grade soya beans or second grade soya beans) varies from year to year. However, it also varies, substantially, across locales within years. Consequently, combining years does not substantially increase this source of variation.<sup>44</sup> For the retail price data, the first (1988) Price Statistics Yearbook provides data on average prices in state commercial establishments and, in some cases, average prices in all commercial establishments. I use the data on all commercial establishments whenever these are available. Excluding the data on state commercial establishments from the sample only strengthens the results (i.e. the positive trend in retail prices is greater). Although it is not specified, the data in later issues of the Yearbook, based upon a comparison with the data in the 1988 volume, appear to cover all commercial establishments.

Regarding the monthly data, the data for 6/96 are an exact duplicate of the data for 5/96, so I exclude them from the sample. Part of the printed data for 1/93 and 2/93 are hopelessly jumbled, and these also are excluded from the sample. The monthly data were actually collected every ten days, but China Price magazine reports only one date within the month (I have been unable to get the other price reports). For the period 3/90 to 11/92 the data are for the 5th of the month, for the period 12/92 to 10/93 they cover the 15th of the month, while for the period 10/93 to 5/99 they correspond to the 25th of the month. So 11/25/93 is unreported, while I have two dates in 10/93, for which I insert separate time dummies.

Finally, I should note that I eliminate all products with less than 5 price observations from the sample, to avoid having the results driven by standard deviations calculated off of tiny samples. I also eliminate the annual data on People's Daily newspaper and Mass Movies magazine as the reported prices of these, with a few rare exceptions, are identical everywhere.

Table IV: The Chinese GDP data are the same as those used in Table II, i.e. are drawn from the provincial yearbooks. The Chinese employment data are compiled from the provincial yearbooks, A Compilation of Historical Statistics (State Statistical Bureau 1990) and Hsueh, Li and Liu [1993]. I take the provincial yearbooks as more accurate where these disagree with the other two sources. I should note that the provincial employment numbers differ, slightly, from those published in national sources such as the China Statistical Yearbook. Similarly, the provincial numbers are slightly different than the total of the sub-provincial estimates (also reported in the provincial yearbooks). Usually, higher level Chinese data are simply the sum total of lower level estimates. This is not the case for employment data, where each level uses its own surveys and estimation procedures. The differences, however, are quite small.

The United States data come from the Bureau of Economic Analysis' disk "Gross State Product by Industry 1977-1994" and CD-Rom "State Personal Income 1969-95".

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44. I have tried, however, to identify substantial changes in the universe of products covered and, when these occur, use them to define new product types. Thus, for example, in the monthly data there is a shift from reporting the prices of ordinary flour to those of enriched flour. In the annual data these are considered substantially different products (i.e. are reported separately), and I treat them as such in the analysis of the monthly data.

Table V and Figures VI and VII: The primary employment data are the same as those used in Table IV. Data from the China Statistical Yearbook on monthly rainfall in a major city in each province are used to calculate the mean monthly "provincial" rainfall and its coefficient of variation (although a few extra cities appear in the Yearbook over time, the historical issues of the Yearbook only present data on rainfall in one city in each province, so the choice of city is not an issue). All of the remaining data are compiled from the China Statistical Yearbook, A Compilation of Historical Statistics (State Statistical Bureau 1990) and Hsueh, Li and Liu [1993]. As the Yearbook data for the mid-1980s do not separate Hainan from Guangdong or Chongqing from Sichuan, in the analysis I use the 29 provincial definitions in place in 1985, adding Hainan to Guangdong and Chongqing to Sichuan as necessary to generate a consistent series.

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TABLE I  
Distribution of Government Budgetary Revenue by Sector (shares)

	Industry	Agriculture	Commerce	Transportation	Construction	Other
1952	0.36	0.21	0.24	0.05	0.00	0.13
1965	0.73	0.07	0.07	0.09	0.00	0.04
1978	0.75	0.03	0.12	0.07	0.00	0.03
1995	0.44	0.06	0.33	0.04	0.02	0.12

Industry includes mining, manufacturing and utilities. Revenue is classified according to the nature of the institution, not the type of revenue, e.g. "industry" includes non-industrial revenue collected by industrial ministries.

TABLE II  
Convergence in the Structure of Output

Deviations from provincial  
average structure:

	Absolute						Squared					
	Unweighted			Weighted			Unweighted			Weighted		
	T	C	I	T	C	I	T	C	I	T	C	I
1978	6.91	2.94	3.97	7.00	3.73	3.27	1.00	0.53	0.47	1.04	0.68	0.37
1997	5.23	2.28	2.94	4.68	2.78	1.90	0.52	0.25	0.27	0.36	0.22	0.14
78/97	0.76	0.78	0.74	0.67	0.75	0.58	0.52	0.47	0.58	0.35	0.33	0.38

Deviations from  
national structure:

	Absolute						Squared					
	Unweighted			Weighted			Unweighted			Weighted		
	T	C	I	T	C	I	T	C	I	T	C	I
1978	7.15	2.95	4.19	6.88	3.42	3.46	1.05	0.51	0.54	0.98	0.56	0.42
1997	5.37	1.96	3.41	4.06	1.99	2.07	0.57	0.23	0.34	0.30	0.14	0.17
78/97	0.75	0.66	0.81	0.59	0.58	0.60	0.55	0.45	0.64	0.31	0.24	0.39

T = total, C = coastal, I = interior.

TABLE III  
Summary of Price Data

	Retail Prices	Agricultural Purchase Prices	Industrial Materials Prices	Agricultural Market Prices
Geographic unit	city	province	city	city
Frequency	annual	annual	monthly	monthly
# of Products	305	130	49	33
# of Time Periods	8	8	110	71
# Prod. x Time Combinations*	1774	690	3853	1971
# of Price Reports*	48717	10361	79824	46135

(\* Product x time period combinations and number of city/provincial price observations used in the analysis (products with less than 5 price observations in a time period eliminated from the sample).

TABLE IV  
Variance Decomposition - Primary vs. Secondary Industry

	$\ln\left(\frac{P_P Q_P}{P_S Q_S}\right)$	Variance of: $\ln\left(\frac{P_P Q_P / L_P}{P_S Q_S / L_S}\right)$	$\ln\left(\frac{L_P}{L_S}\right)$	Covariance of: $\ln\left(\frac{P_P Q_P}{P_S Q_S}\right), \ln\left(\frac{L_P}{L_S}\right)$
China (28 provinces*)				
1978	0.71	0.12	0.56	0.01
1997	0.53	0.15	0.73	-0.17
United States (50 states & D.C.)				
1977	1.18	0.31	0.63	0.12
1994	0.72	0.32	0.37	0.01
China (14 provinces#)				
1952	1.54	0.44	0.85	0.13
1965	0.98	0.16	0.64	0.09
1978	0.72	0.16	0.63	-0.04
1997	0.58	0.20	0.68	-0.15

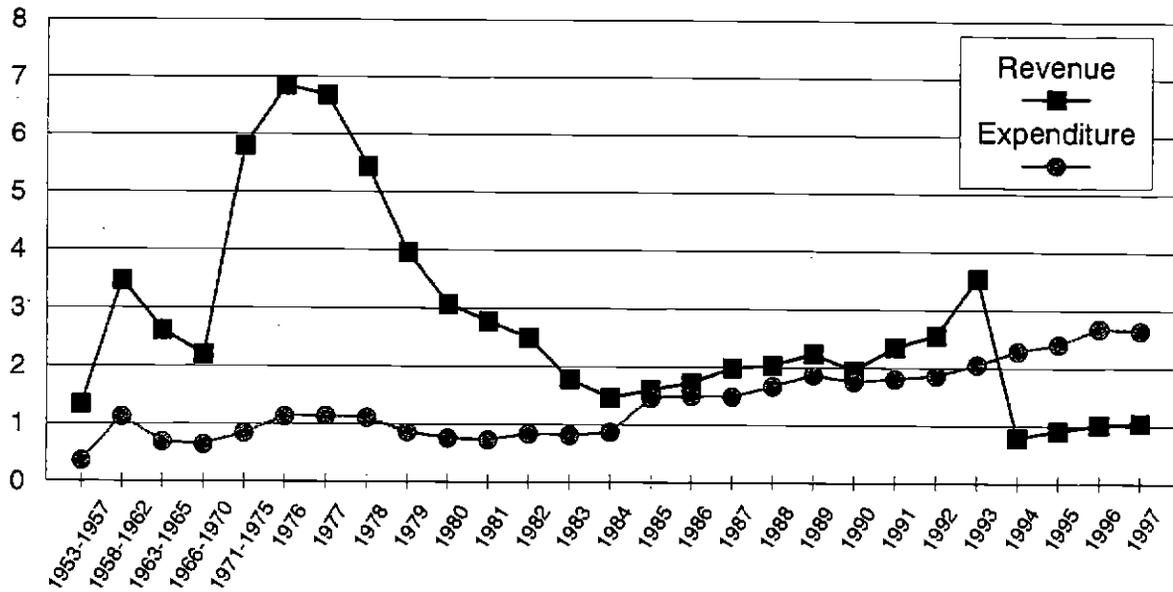
(\*) All, but Tianjin & Zhejiang. (#) Inner Mongolia, Liaoning, Jilin, Heilongjiang, Shanghai, Jiangxi, Henan, Hunan, Guangdong, Sichuan, Guizhou, Yunnan, Qinghai and Ningxia.

TABLE V  
Productivity, Factor Allocations and the Weather  
(Annual observations, 29 Provinces, 1985 to 1997)

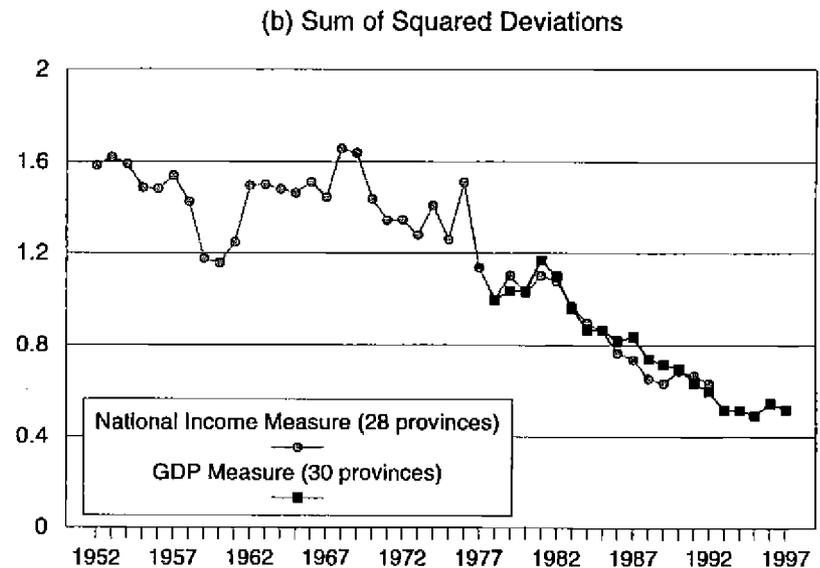
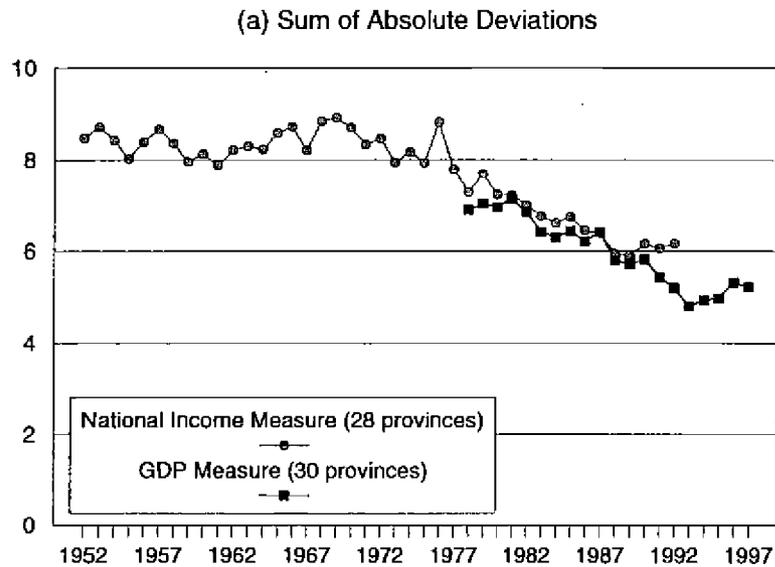
	(1) Yield	(2) Irri	(3) Fert	(4) Power	(5) Labour	(6) Lshare	(7) OutputC	(8) Yield
With Provincial Dummies:								
Year	.009** (3.1)	.019** (8.3)	.091** (33.2)	.049** (20.5)	.006** (3.7)	-.004** (7.6)	.027** (11.4)	.026** (5.9)
Irri	.309** (6.3)							.199** (4.5)
Fert	.214** (6.2)							.155** (4.3)
Power	-.043 (1.0)							-.080* (1.9)
Labour	-.091 (1.5)							-.148* (2.4)
Prec	.021** (2.6)							
Prec2	-.001** (2.7)							
CVPrec	-.040* (1.9)							
Wtime		-.233** (4.8)	-.549** (9.4)	-.194** (3.8)	-.155** (4.4)	-.080** (6.4)	-.426** (8.5)	-.260** (5.6)
R <sup>2</sup>	.942	.958	.954	.970	.975	.984	.922	.944
Without Provincial Dummies:								
Year		.019* (1.8)	.091** (10.7)	.050** (4.0)	.006 (0.7)	-.004 (1.0)	.027** (3.3)	
Weather		-.540 (0.3)	12.4** (9.6)	-3.27* (1.8)	7.34** (5.3)	.790 (1.2)	2.24* (1.8)	
Wtime		-.233 (1.0)	-.549** (3.0)	-.198 (0.8)	-.155 (0.8)	-.080 (0.9)	-.426* (2.5)	
R <sup>2</sup>		.027	.522	.136	.171	.029	.031	
N	374	377	377	376	377	377	377	376

Notes: Yield = ln(grain output/grain sown area); Irri = ln(irrigated area/total sown area); Fert = ln(chemical fertilizers/total sown area); Power = ln(total power of agricultural machinery (kw)/total sown area); Labour = ln(employment in primary industry/total sown area); Prec = average monthly rainfall (cm); Prec2 = Prec squared; CVPrec = coefficient of variation of monthly rainfall; Lshare = primary employment/total employment; OutputC = ln(grain output per capita); Weather = mean value of weather variables multiplied by coefficients in column (1); Wtime = Weather \* (year - 1985); (\*) Significant at the 10% level; (\*\*) Significant at the 1% level. T-statistics in parentheses. The sample size increases slightly between column (1) and columns (2)-(8) as, using the mean value of weather, I do not need observations on weather variables in each period.

Figure I: Ratio of Local to Central Revenue & Expenditure

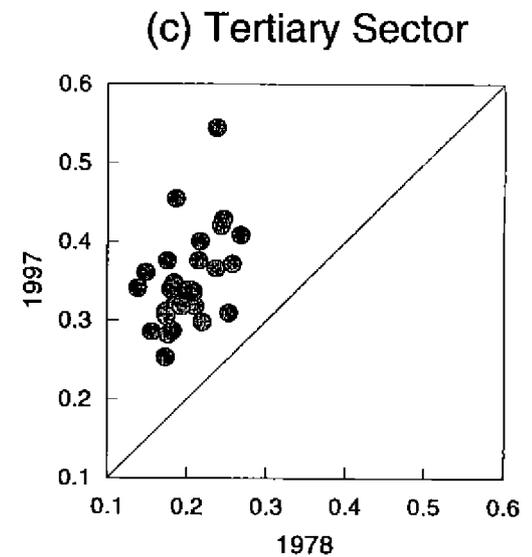
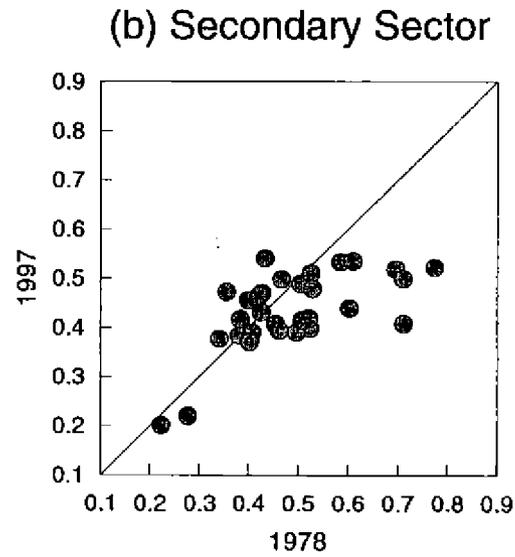
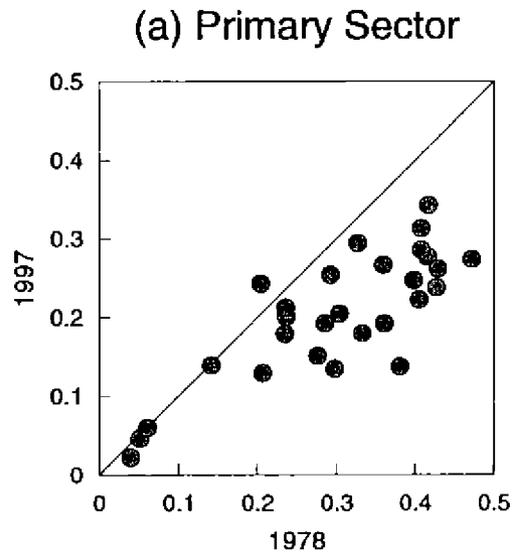


**Figure II: Convergence in the Composition of Output  
(deviation from average production structure in current prices)**

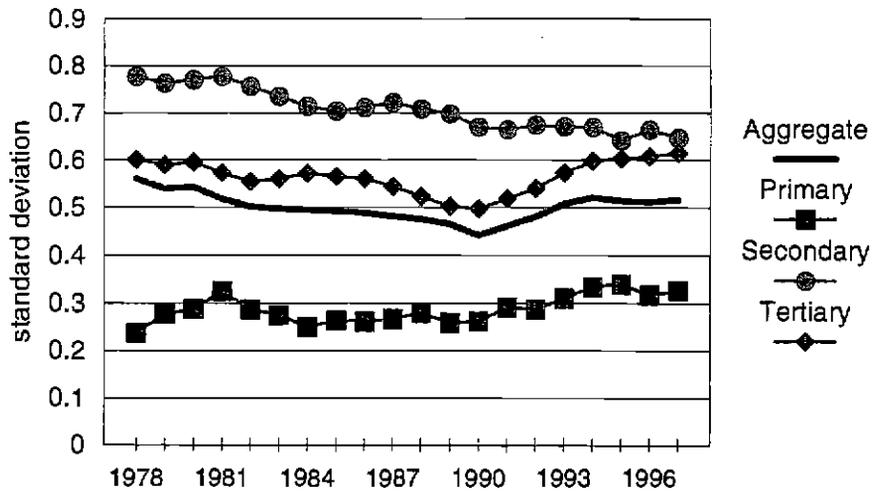


Note: National Income divided into five sectors: agriculture, industry (mining, manufacturing and utilities), construction, transport and commerce (wholesale and retail trade and catering). GDP divided into three sectors: primary (agriculture), secondary (mining, manufacturing, construction and utilities) and tertiary (services).

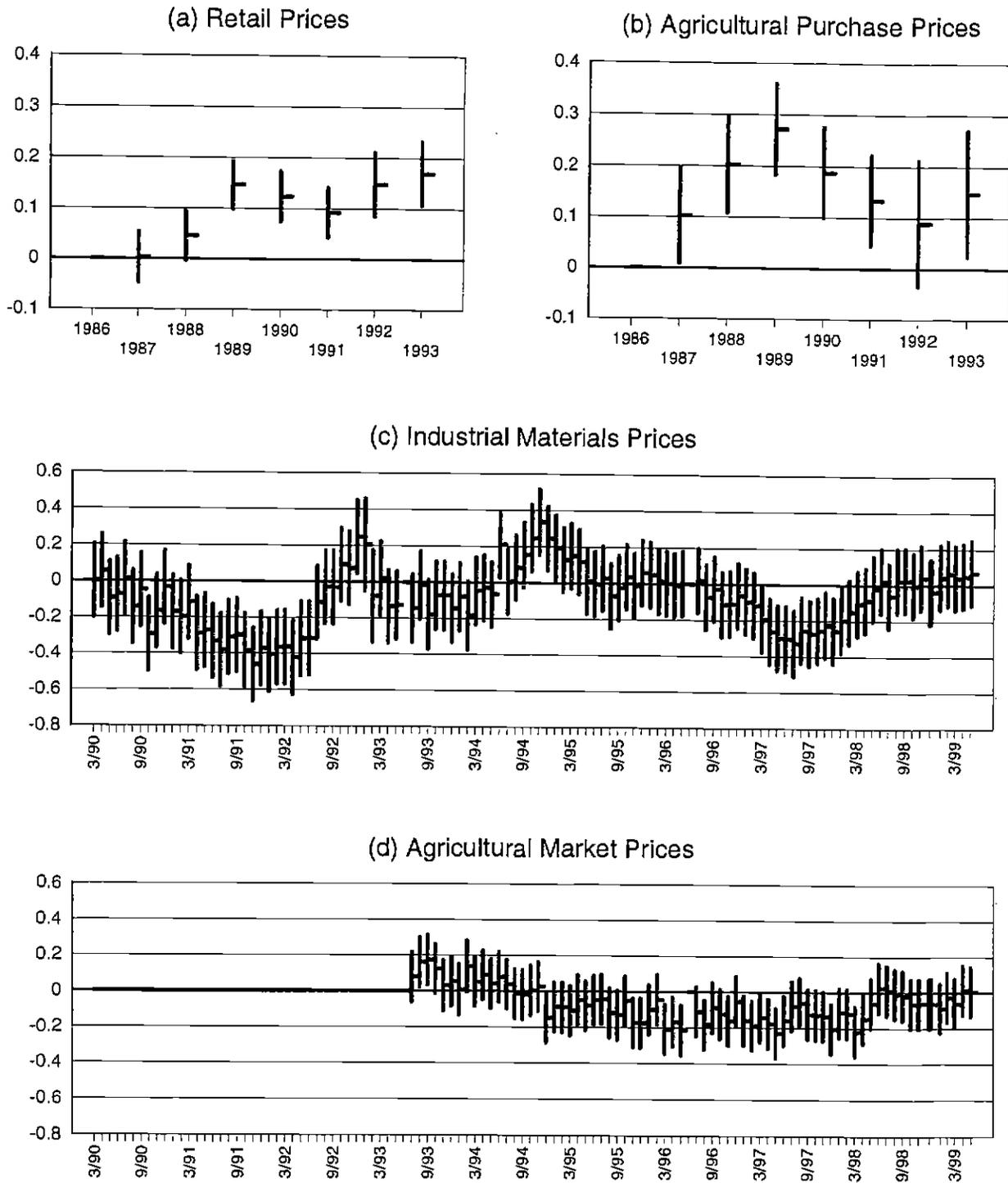
**Figure III: Shares of GDP  
(30 provinces)**



**Figure IV: Standard Deviation of  $\ln(\text{GDP}/\text{Capita})$   
(30 provinces)**

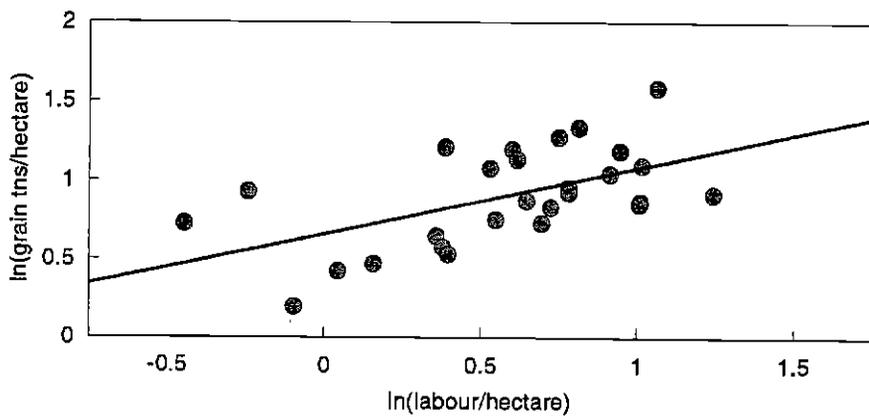


**Figure V: Trends in the Standard Deviation of In Product Prices  
(time dummies plus or minus two standard errors)**

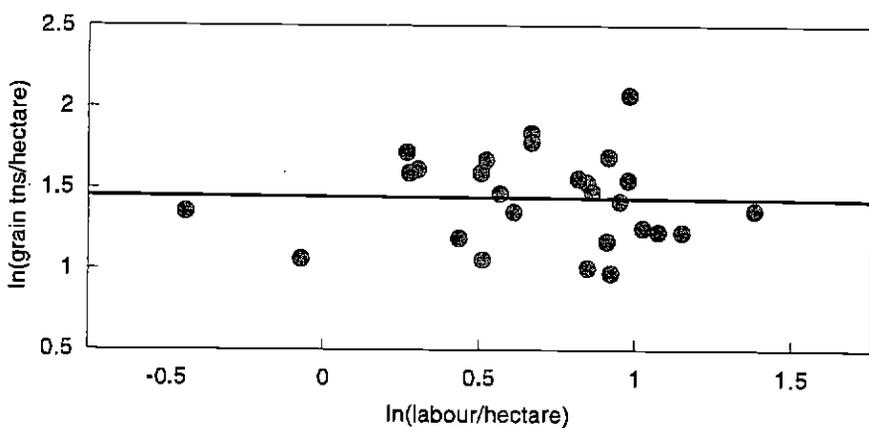


**Figure VI: Factor Intensity & Productivity  
(27 provinces)**

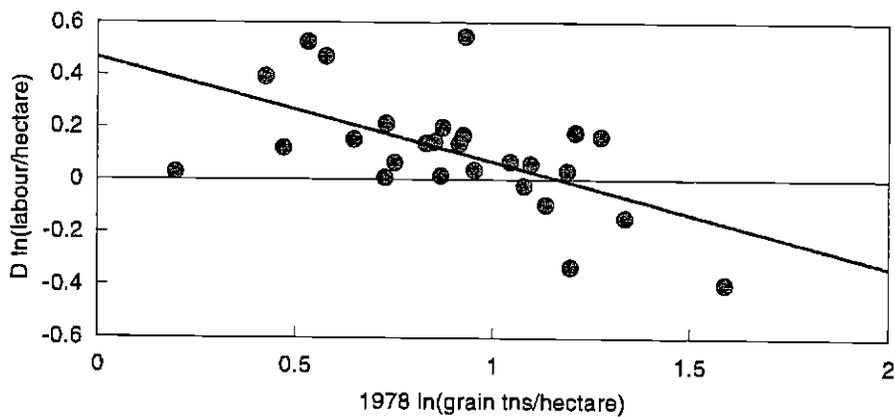
(a) Levels: 1978



(b) Levels: 1997



(c) Changes: 1978-1997



**Figure VII: Factor Intensity & Productivity  
(15 provinces)**

