The Razor's Edge:
Distortions and Incremental Reform
in the People's Republic of China

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

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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 & Roland 1995, Martinelli & 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 leads to the creation of rental opportunities which, due to the gradual nature of the reform process, are fairly long lasting. This allows for a prolonged battle to capture, and then protect, these rents, leading to the creation of new distortions in the economy. 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 pro-

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cessing or direct export.[1] 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.[2]

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 upon moving the economy toward free market institutions.

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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).

This paper proceeds as follows: Section II below, "Stories," provides 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. According to this account, in the reform era local governments throughout the Chinese economy entered high margin industries to capture the implicit monopsony and monopoly rents these enjoyed. As interregional competition developed, barriers to trade were used to defend otherwise untenable industrial structures. Empirically, this story suggests that one should observe convergence in the interregional structure of production during the reform era, one which can credibly be described as a movement against the patterns of specialization implied by comparative advantage. To this end, section III, "Data", presents data on the interregional dispersion of production. Unlike the Soviet Union, which sought to achieve economies of scale through industrial concentration, under the central plan the People's Republic pursued a policy of forced industrial duplication, regardless of the dictates of comparative advantage, as it sought to promote economic self sufficiency in the different regions of the economy. Despite this legacy, I find that the dominant trend during the reform period was for further convergence, as provinces and cities continued to duplicate each other's industries.

Section IV, "Explanations", examines alternative explanations of these aggregate trends, considering, in particular, their relation to patterns of comparative advantage. I begin with the simplest possible analysis, asking whether the observed convergence in the structure of production might not simply be described as the consequence of a convergence in levels of income. In the presence of transport costs, patterns of local demand will influence the structure of local production. Further, to the degree that the interregional dispersion of comparative advantage (e.g. capital-labour ratios) is related to the interregional dispersion of income, changes in the income distribution proxy for the influence of comparative advantage on the dispersion of production. I find that while, historically, the dispersion of income is significantly related to the dispersion of production in the People's Republic, changes in the moments of the interregional

income distribution during the reform period are too small to account for anything but a small fraction of the observed convergence in the structure of production. Put differently, in the relation between the dispersion of production and the dispersion of income there is a statistically significant, and dominant, negative time trend; for any level of income dispersion the dispersion of production falls rapidly, both during the period in which the plan pursued forced diversification and during the period of economic reform.

Next, I turn to a more direct consideration of the influence of changes in trade barriers and comparative advantage on patterns of production and factor allocation. Free trade tends to hide the underlying determinants of comparative advantage, transforming factor abundance and autarky price advantages into traded quantities of production. As trade barriers increase, however, comparative advantage is revealed. One can show, in particular, that, across a wide variety of models, a rise in trade barriers reveals patterns of comparative advantage by raising the average product of labour in industries in which the economy has a comparative advantage while, simultaneously, lowering the allocation of labour to those sectors. In contrast, for given levels of trade barriers, if an economy's comparative advantage converges to that of its neighbours, the relative average product of labour in the sectors in which it (formerly) had a comparative advantage will come to resemble that of its trading partners. Decomposing the interregional variation in the structure of production into the variance of relative labour productivities, the variance of relative labour allocations, and the covariance between the two, I find that both the interregional variation in average products and labour allocations rose during the reform period, while the covariance between the two deteriorated rapidly. The correlation between labour allocations and labour productivities, about zero in 1978, had fallen to -.8 by 1992, as regions increasingly concentrated labour in sectors in which its average product was, perversely, lower. These changes, while incompatible with a convergence in patterns of comparative advantage, are precisely what is predicted by a rise of interregional barriers to trade.

Finally, I consider the role of transport constraints. While a movement to autarky might be

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caused by an increase in trade barriers, it could just as easily be driven by a rise in the relative cost of internal transport. Anecdotal accounts of an overstrained transport structure (particularly railways) and a rapid fall in the domestic movement of goods relative to GDP during the reform period support this hypothesis. However, there has been a substantial improvement in the quality of transport infrastructure and, perhaps more importantly, there is little statistical evidence of increasing transport delays, which one would expect in an environment with worsening capacity constraints. Most fundamentally, however, I find that the decline in internal transport has been greatest in the coastal areas, which have access to coastal shipping but have nevertheless chosen to use a rising fraction of port capacity for international trade. These data suggest that the falloff in internal transport is less driven by supply constraints than by a falloff in demand. Overall, the data of Section IV are consistent with the view of an economy that has expanded its international linkages while raising barriers, and reducing the degree of interregional specialization, in its own internal market. Section V concludes the paper.

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. 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.[3] 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

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[3] Government revenue by sector is computed net of enterprise losses. In addition, 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 was no longer included under revenue and expenditure. Further, beginning 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 (hereafter, CSY) and the China Public Finance Yearbook I have been able to construct a consistent historical series, which forms the basis of the data presented in Table I and Figure I below, using the following methodology: (1) Price subsidies are counted as part of expenditure, not as 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% of revenue (using my series, which matches the most recent official definition of revenue) in 1978 to 111% in 1992. Until 1992 the definition of extra-budgetary revenue included the various surcharges and levies raised by governmental 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. While it is true that local governments tap the extra-budgetary funds of enterprises (Wong 1991a), it seems excessive to consider the full value of these funds as being under government budgetary control (this is almost equivalent to considering the depreciation allowances or investment tax credits of U.S. firms as being part of the U.S. government budget). 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% of the value of budgetary revenue in that year. If one similarly excludes state enterprises from the 1978 data, the value of extra-budgetary revenue as a percent of budgetary revenue falls to 8%. With regards to this paper, since extra-budgetary funds are not reported by sector of origin and, furthermore, since there is no historical breakdown of non-state enterprise extra-budgetary funds into local and central categories, I cannot adjust the earlier data and, hence, do not include extra-budgetary revenue in the data reported below.

Table I: Distribution of Government Budgetary Revenue by Sector							
	Light Industry	Heavy Industry	Agriculture	Commerce	Transportation	Construction	Other
1952	0.24	0.11	0.21	0.24	0.05	0.00	0.13
1965	0.30	0.43	0.07	0.07	0.09	0.00	0.04
1978	0.30	0.45	0.03	0.12	0.07	0.00	0.03
1995	0.24	0.20	0.06	0.33	0.04	0.02	0.12

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, and then used to finance the development of industry.[4] 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

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[4] 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.

Figure I: Ratio of Local to Central Revenue & Expenditure
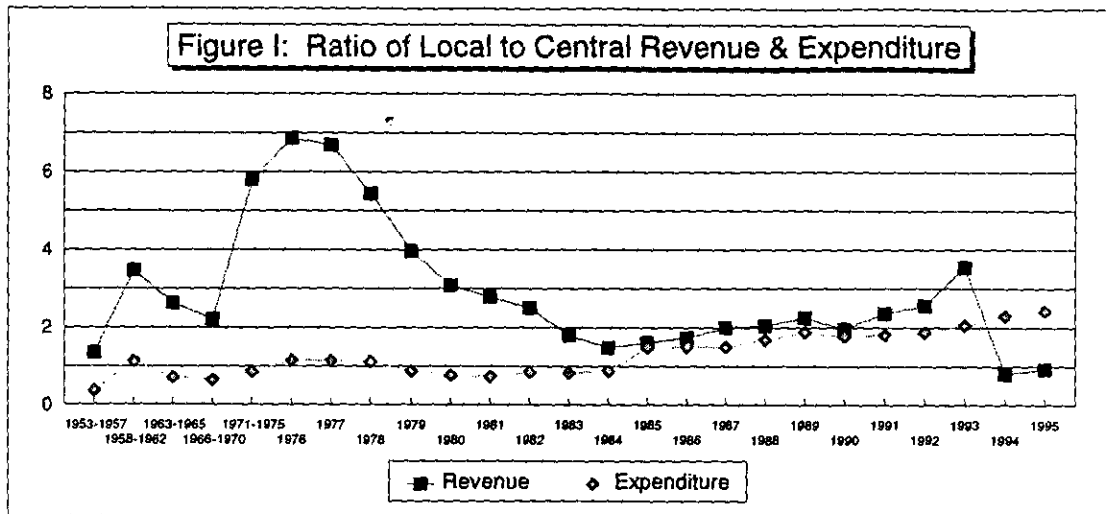
collection declined rapidly as the central government increased its share of revenue collection.

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 bureau-

cracy.[5] Thus, under the plan, and even during the reform period, most revenue was collected by

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.

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[5] 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), as well as China Daily 25 Sep. - 1 Oct, 1994, p. 2; Heilongjiang Ribao, 18 Sept, 1994, p. 1; Hunan Ribao, 16 August 1994, p. 1; Shaanxi Ribao, 19 August, 1994, p. 1; and Xinhua Ribao (Nanjing) 27 July, 1994, p. 1. 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.

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.[6] 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, county, city and locality tried to develop its own duplicate set of industries.[7] 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

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[6] 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."

[7] 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.

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.[8]

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 renegotation and renegement (by both sides).[9] 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

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[8] 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 Government Finance Statistics 1950-1985, Hsueh, Li and Liu (1993) and CSY 1993.

[9] 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, which persists to this day.

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 undoubtably 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 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.[10]

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 enterprise development, and instructing central and local authorities to incorporate the supply of rural enterprises into their plans.[11] 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 suported 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

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[10] 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.

[11] 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.

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 raw materials at low prices. This led to the development of "wars" over coal, cotton, jute, silk-worm cocoons, and tobacco, among other materials.[12] 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 barri-

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[12] 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: *Jingjixue Zhoubao*, 30 April 1989, p. 1; *Zhongguo Tongxun She* broadcast, 355 GMT 11 Aug. 1989; *Jingji Ribao* (Beijing) 11 Nov. 1989, p. 2; *Jingji Guanli* (Beijing) No. 12, Dec. 1989, pp. 18-21; *Renmin Ribao* 11 June 1990, p. 6; *Jingji Cankao* (Beijing) 4 June 1990 p. 1, 27 April 1990 p. 1, 24 June 1990 p. 1, 20 July 1990 p.1; and China Daily (Beijing, Business Weekly) 10 Dec. 1990, p. 4. For this draft of the paper, I have focused on citations for the 1989-1991 period in this and the following two footnotes.

ers (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 powders and soaps, tires, tractors, engines, processed foods, and food flavourings.[13] 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.[14]

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

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[13] 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 *Liaowang* (Beijing) No. 45, 6 Nov. 1989, pp. 18-20; *Wen Wei Po* (Hong Kong) 24 Jan. 1991, p. 6; Hangzhou-Zhejiang Provincial Broadcast Service 1000 GMT 21 Dec. 1990; *Guangming Ribao* 3 Nov. 1990, p. 3; *Tangtai* (Hong Kong) No. 41, 8 Sep. 1990, pp. 13-14; *Jingji Ribao* (Beijing) 14 July 1990, p. 2; *Renmin Ribao* 30 July 1990 p. 2, 5 June 1990 p. 5; *Jingji Cankao* (Beijing) 24 June 1990 p. 1, 4 June 1990 p. 1; *Ta Kung Pao* (Hong Kong) 22 June 1990, p. 2; China Daily (Beijing) 9 June 1990, p. 1; *Xinhua* Domestic Service 0815 GMT 8 May 1990, 1031 GMT 10 April 1990; *Ching Chi Tao Pao* (Hong Kong) No. 9, 5 March 1990, pp. 8-9; *Zhongguo Tongxun She* (Hong Kong) 0909 GMT 11 Feb. 1990; Harbin Heilongjiang Provincial Service 2100 GMT 31 May 1990, and *Qunyan* (Beijing) No. 2, 7 Feb. 1991, pp. 22-23. For a recent foreign press article on overcapacity in textiles and the diversion of raw material supplies to less efficient firms, see FEER, "Protection Has a Price" (29 August 1996).

[14] On the use of the legal system, see *Tangtai* (Hong Kong) No. 41, 8 Sep. 1990, pp. 13-14; *Renmin Ribao* 10 Dec. 1991, p. 5; Shanghai City Service 2300 GMT 5 Dec. 1990; and *Jingji Cankao* (Beijing) 1 April 1990, p. 4.

conflict.[15] 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 these gateways to the international market.[16] 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.[17] In a planned economy, where state

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[15] 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, *Xinhua* Domestic Service 0339 GMT, 28 July 1993, China Daily 29 July 1993, p. 1 and *Renmin Ribao*, 2 August 1993, p. 2.

[16] 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).

[17] 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 *Liaowang* Overseas Edition (Chinese, Beijing), No. 51, 21 Dec. 1992, p. 2; *Xinhua* Domestic Service, 0734 GMT 2 April 1993, 2102 GMT 22 April 1993; Jiangsu People's Radio Network, 1015 GMT 23 March 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 *Xinhua* (in English), 1435 GMT 2 Sep. 1989; *Zhongguo Xinwen She*

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 embeded 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 all else fails, and trade barriers cannot be fruitfully enforced, there always exists the central banking system which can be repeatedly pres-

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0915 GMT 4 Sep. 1993; *Jingji Ribao* (Beijing) 8 June 1990, p. 3; and *Xinhua* Domestic Service, 0830 GMT 24 Feb. 1993. General reports on provincial price controls and subsidies are given in Changsha Hunan Provincial Service, 2300 GMT 24 Jan 1990; *Renmin Ribao* 6 Oct. 1990, pp. 1 & 4; *Xinhua* (in English), 1103 GMT 30 Dec. 1988, 1507 GMT 20 Jan. 1990, 1039 GMT 2 Nov. 1992, 0755 GMT 14 Nov. 1992, 0946 GMT 30 Nov. 1992; Shanghai City Service, 0900 GMT 13 Sep. 1989; Hefei Anhui Provincial Service, 1100 GMT 30 Dec. 1988; *Nanfang Ribao* (Guangzhou), 19 March 1991, p. 1; Jinan Shandong People's Radio Network (Mandarin), 2300 GMT 9 Jan. 1993; China Daily (Business Weekly), 10 Jan. 1993, p. 3; and Jiangsu People's Radio Network, 2300 GMT 23 July 1993. The FEER ("The power of the purse," 18 June 1987) reports that central attempts to free (and rationalize) the prices faced by industrial enterprises were often undermined by localities and government departments, which simply imposed new controls.

sured into extending additional credit to enterprises, providing local revenue and employment at the expense of national inflation. Thus, while it is probably the case that efficiency considerations, the demands of other social and political groups, and interregional 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 hysterisis in public finance and political relations. As the data in the next section show, the early part of the reform period witnessed a tremendous convergence in the structure of production, as different regions of the economy duplicated each other's industries. By the early 1990s this process appears to have slowed and, by some measures, even stopped. It shows little tendency, however, to reverse itself.

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 inate skills and resources to develop efficient and competitive industrial enterprises.[18] In this section I move beyond anecdotes and stories to the analysis of aggregate data. documenting how, despite widespread diversification under the policies of the plan, the dominant trend during the reform period was continued convergence, as different regions continued to copy each other's industries. In later sections I consider competing analytical explanations of these aggregate trends.[19]

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[18] 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) describe the 1992 State Council Regulations on Transforming Economic Mechanisms of State Owned Enterprises as part of "an unprecedented and virtually unrestrained push toward the market" during the 1990s. In contrast, some Chinese economists (anonymous paper) view 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 rights over enterprises."

[19] In considering trends, one is inevitably drawn to the question of levels. A World Bank study led by Kumar (1994), and similarly concerned with issues of interregional conflict, 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. This, however, might not be a reasonable comparison, given that the average Chinese region would have had a population of 100 million people. In general, with the possible exception of India, it is difficult to think of many comparators on the planet for a poor, predominantly agrarian economy of 1.2 billion people. Hence, my approach in this paper, which is to consider intertemporal trends within the People's Republic and test these against explanations centred around the link between factor allocations and comparative advantage.

I begin my statistical analysis by examining interregional convergence in the structure of aggregate output. Figure II below presents the sum across 28 of China's 30 provinces of the absolute values of the deviations of the output shares of different economic sectors from the national average.[20] 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 fell 21%. Surprisingly, during the reform period convergence continued apace, with the sum of absolute deviations falling an additional 16% from 1978 to 1992. The more conventional GDP series, which divides output into primary, secondary, and tertiary sectors, shows somewhat more convergence, with the sum of absolute deviations falling 25% by 1992 and a

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[20] Specifically, the absolute and weighted deviations equal

$$\sum_i \sum_j | S_{ij} - \overline{S}_j | \qquad I^* \sum_i \sum_j W_i^* | S_{ij} - \overline{S}_j |,$$

respectively, where S_{ij} denotes the share of sector j in province i's output, $\overline{S}_j$ the share of sector j in national output, W_i the share of province i in national output and I, equal to the number of provinces, simply adjusts for the fact that the average weight is 1/I. Since this measure is influenced by the number of sectors and provinces used in its construction, the reader should not make too much of the differences between the levels of the different series shown in this section.

China is divided administratively into 30 provinces and provincial level cities and autonomous territories. I exclude Tibet and Hainan, however, because my data on national income in these two provinces do not extend back before 1979. Together these two provinces accounted for only 0.7% of national income in 1992 (CSY 1994, tables 2-11 & 2-15). In this, and other figures below, I take as my measure of "national" output the sum of the output of the remaining (28) provinces. While the Figure presents the results using current prices, I have also computed the national income measures using provincial income in constant 1952 prices. The results are very similar.

The data used in this section of the paper were compiled from A Compilation of Historical Statistical Material for the Provinces, Autonomous Territories and Directly Administered Cities 1949-1989 (hereafter, Historical Statistics), Hsueh, Li and Liu (1993), the annual issues of the statistical yearbooks put out by each province, and the annual issues of the CSY. I combined the different sources, reconciling discrepancies and correcting obvious misprints. These data are available, upon request, from the author.

Figure II: Convergence in the Structure of Output
(28 Provinces - Current Prices)

Legend:
- ■ National Income - Absolute Deviation
- ● GDP - Absolute Deviation
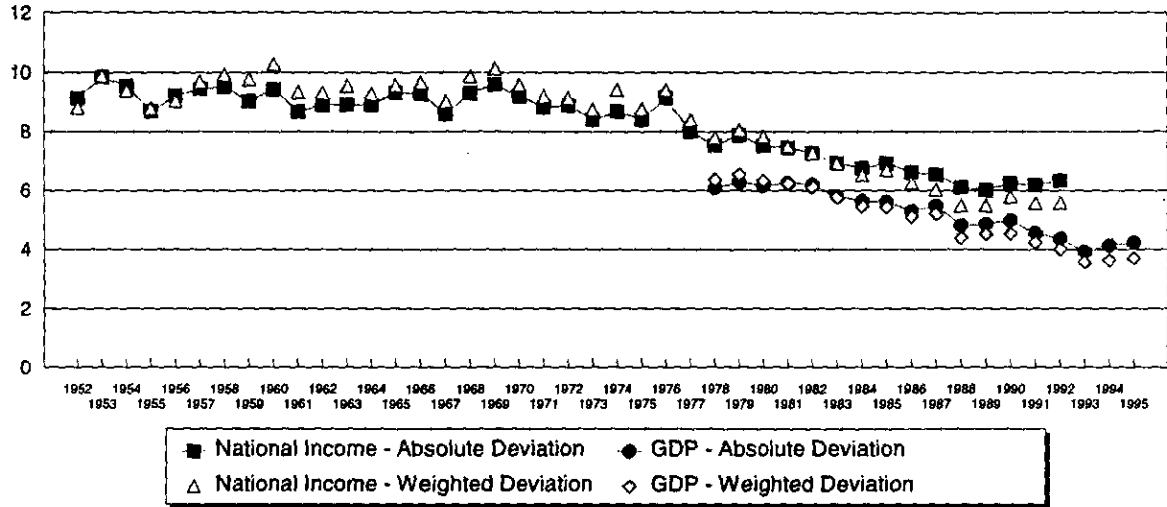- △ National Income - Weighted Deviation
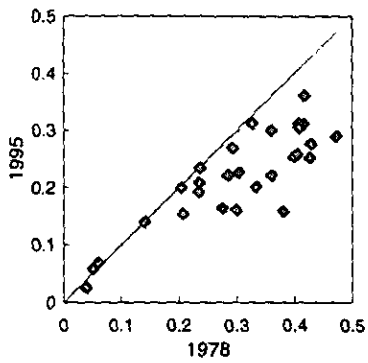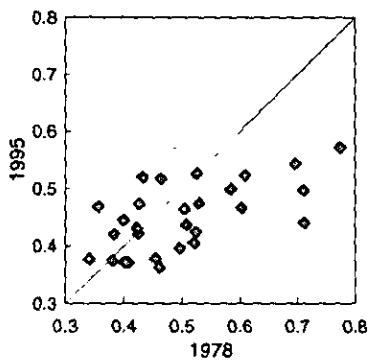- ◇ GDP - Weighted Deviation
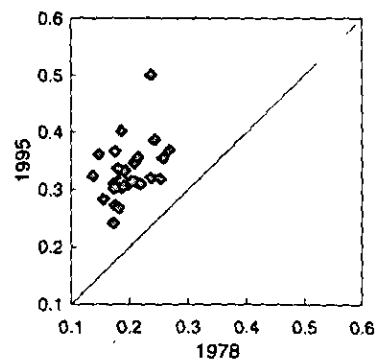
Figure III: Shares of GDP
(28 Provinces)

(a) Primary Sector

(b) Secondary Sector

(a) Tertiary Sector

20

total of 31% by 1995. Weighted measures, which place less emphasis on the small northwest provinces, generally indicate more convergence with, for example, the sum of weighted GDP deviations falling 42% between 1978 and 1995. I draw the reader's attention to the fact that the national income series seem to suggest that the convergence process had reached something of a steady state by 1988. Although this view is belied by the GDP series, which shows continued convergence during the 1990s, it is supported by many of the results which follow.

Figure III graphs the shares of primary, secondary and tertiary industry in the GDP of each province in 1978 against the corresponding share in 1995, providing a more immediate visual illustration of the convergence in the structure of production during the reform period. Panel (b) shows the enormous compression in the variation in the share of secondary industry (manufacturing and construction) between 1978 and 1995. While the share of secondary industry varied between 34% and 77% in 1978, by 1995 the range of variation was reduced to between 36% and 57%. As highlighted by the 45 degree line, provinces with low initial secondary shares increased the share of that sector, while provinces with high initial secondary shares witnessed a decline in its contribution to GDP. As regards primary industry (agriculture, forestry and fishing), panel (a), most provinces witnessed a decrease 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. As shown in panel (c), all provinces increased the share of services in total production and the degree of dispersion, with the exception of the appearance of the high output outlier of Beijing, remained roughly constant. There is some evidence, however, of convergence within services itself. Considering national income service output alone, broken down into the shares of transport and commerce in their combined total, the sum of provincial deviations falls 17% between 1978 and 1992, i.e. on a par with the reduction in the sum of the deviations of the shares of all five national income sectors during the same period (Figure II earlier).

21

Figure IV illustrates post-war patterns of convergence within the manufacturing sector. The longer time series breaks manufacturing down into light vs. heavy industry. Following a downward blip during the Great Leap Forward and its aftermath (1958-1962), this series falls steadily during the Cultural Revolution. During the reform period, however, there is little evidence of further convergence, as small declines during the 1980s are completely offset by increases during the 1990s. The Figure also presents a shorter series with manufacturing output divided into five sectors, viz. light industries using agricultural raw materials, light industries using non-agricultural raw materials, excavation heavy industries, raw material heavy industries, and value added heavy industries. These data are more suggestive of a slight downward trend during the reform period, particularly in the weighted sample, where the sum of deviations falls 13% between 1978 and 1989. I should note, however, that, with the exception of the series on the current price output of light vs. heavy industry during the late 1980s, which covers all enterprises, the data used in Figure IV are restricted to enterprises at the township level and above. Consequently, they miss the rapid development and diversification of rural industry during the reform period. Accounting for 96% of industrial output in 1978, the share of enterprises at the township level and above had fallen to 84% by 1989 and 71% by 1994.[21]

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[21] An additional problem is that the data are based upon the gross output value of industry as calculated at the factory level, i.e. netting out intra-enterprise, but not inter-enterprise, intermediate transactions. Thus, they are extremely sensitive to patterns of outsourcing. Surprisingly, the constant price version of this measure grows 2.1% faster, *per annum*, than the GDP value added measure of industrial output during the 1978-1992 period (CSY 1993). Since almost all Chinese data on the sectoral distribution of the value of manufacturing output at the provincial level are restricted to the gross output of enterprises at the township level and above, there is not much one can do about the first problem. Regarding the second problem, in an appendix, available upon request, I estimate the degree of convergence in the structure of the manufacturing output of independent accounting enterprises at the township level and above divided into 36 sectors, using both gross output and value added measures. Both measures show a similar pattern, with declines during the early 1980s followed by upward trends during the early 1990s. The gross output measures, however, indicate a net divergence, with the sum of weighted deviations rising 3% between 1980 and 1992, while the value added measures indicate a small net convergence, with the sum of weighted deviations falling 6% during the same period. Neither change is particularly impressive. National figures cited in this footnote and in the text are computed from the CSY 1986 (p. 43), 1993 (tables 2-12, 2-31, 10-1, & 10-4), and 1995 (tables 2-10 & 12-1).

Figure IV: Variation within Manufacturing
(24 Provinces, Constant 1980 Prices)

Lt. vs. Hvy. - Absolute ◇ 5 Sectors - Absolute △ Lt. vs Hvy. - Absolute
Lt. vs. Hvy. - Weighted ◇ 5 Sectors - Weighted △ Lt. vs.Hvy. - Weighted

24 Provinces = All but Inner Mongolia, Guangdong, Hainan, Yunnan, Tibet & Qinghai.
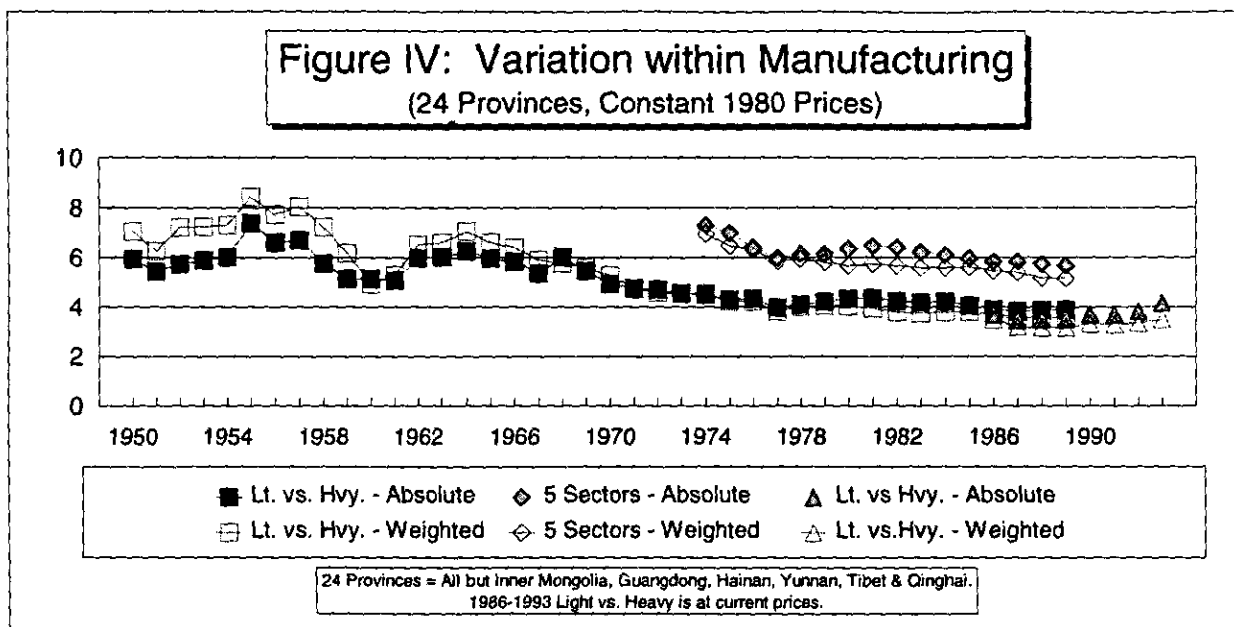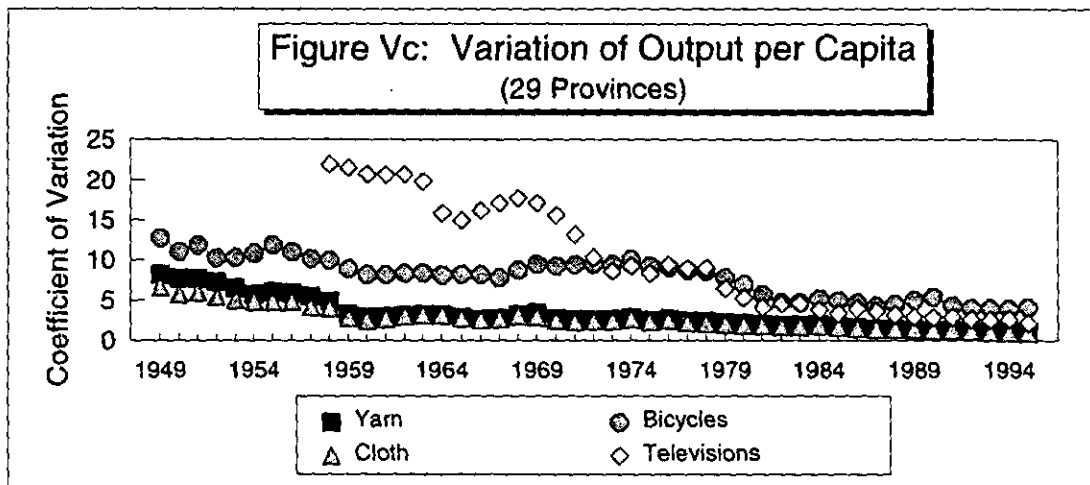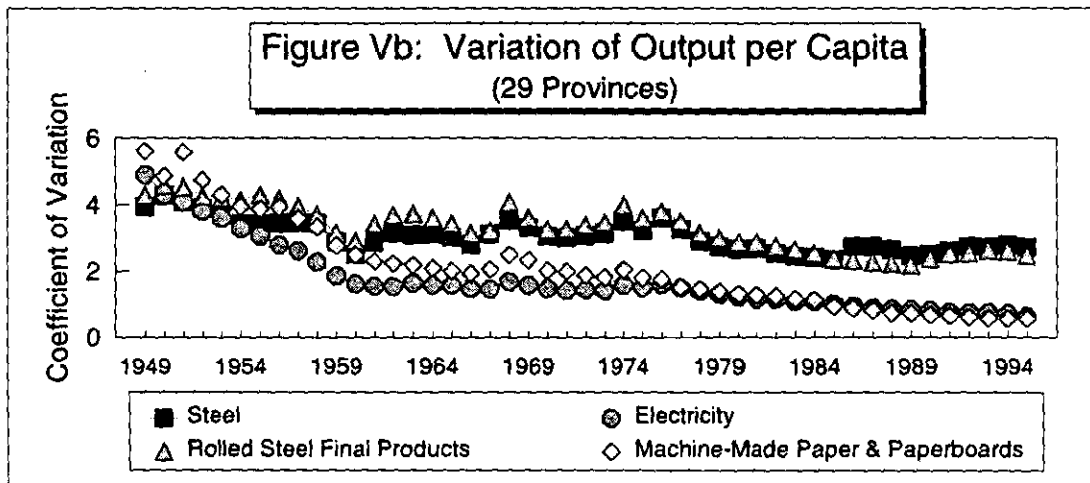1986-1993 Light vs. Heavy is at current prices.

Figure V below takes the analysis to a more detailed level, presenting historical data on the variation around the national mean of the output per capita of major industrial products in China's 29 provinces.[22] Clearly, in the decades preceeding the reforms there was widespread convergence in industrial structure. Running each product's coefficient of variation during the 1949-1978 period on a linear time trend, I find that, with the exception of coal, all of the products show a statistically significant negative coefficient (in a two-tailed 10% level test). Despite the tremendous strides toward industrial duplication made under the plan, convergence continued during the reform period. Between 1978 and 1988 all but three (i.e. coal, sugar, and steel) of the products evince statistically significant negative time trends, while only one (coal) shows a significantly positive trend. As in the earlier comparisons, the post-1988 period appears to have witnessed a weakening of the forces towards convergence, with the number of products showing significantly negative time trends (5) only slightly exceeding the number showing

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[22] The outputs are measured in natural units, i.e. kilowatt hours for electricity, metres for cloth, units for bicycles and televisions, and tonnes for the remaining products. Hainan did not become a separate province until 1988. Hence, the variation across only 29 provinces. For post-1988 data I include Hainan production under Guangdong.

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Figure Va: Variation of Output per Capita
(29 Provinces)

Raw Coal   Sugar
Crude Oil   Cement

Figure Vb: Variation of Output per Capita
(29 Provinces)

Steel   Electricity
Rolled Steel Final Products   Machine-Made Paper & Paperboards

Figure Vc: Variation of Output per Capita
(29 Provinces)

Yarn   Bicycles
Cloth   Televisions
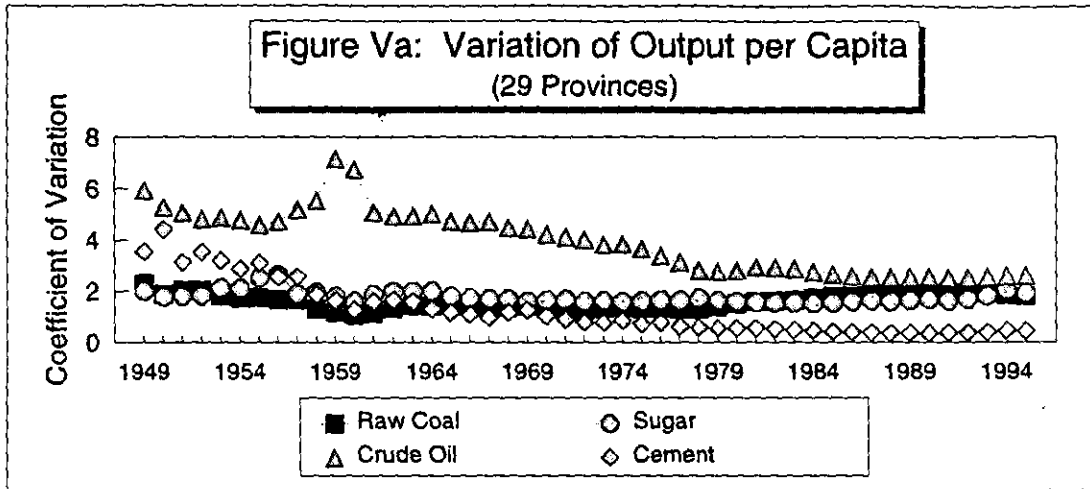
positive trends (4). However, over the reform period as a whole, convergence is overwhelmingly dominant, with 9 products showing significantly negative time trends and only three products showing significantly positive trends (raw coal and sugar) or no trend at all (steel).

Table II below expands the sample to include every single industrial product for which I have been able to collect data for at least three years. Of the 36 products for which I have annual observations for the entire 1981-1995 period, 7 have significantly positive trends and 21 have significantly negative trends in their absolute coefficient of variation. As one expands the sample to include products with less frequent data, the number of insignificant trends rises, but the overall ratio of negative to positive time trends remains about three to one. Among the products with positive time trends (listed in the notes to the Table) one finds a predominance of raw material extraction or processing industries, where, in the face of natural constraints, production is difficult to duplicate on an interregional basis. In contrast, value added manufacturing industries, whose production is not constrained by natural resources, feature prominantly amongst the industries with negative time trends.[23] I should note that, unlike the other measures presented in this section, when one weights the squared deviations, using the population share of each province, the evidence in favour of convergence is somewhat weaker. While in the sample with 15 observations per product the ratio of negative to positive time trends in the weighted coefficients is about three to one, this falls to about one and half to one in the broadest sample. Once again, there is evidence that the tendency toward convergence diminished, and may even have begun to reverse, during the late 1980s and early 1990s. Looking at time trends in the 1988-1995 period, the unweighted coefficients of variation show equal numbers of positive and negative trends,

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[23] Raw material processing is an important exception to the general observation that competition to acquire monopoly rents would lead to a convergence in the structure of production. If raw material production is concentrated, because of natural constraints, and raw material producers decide to duplicate the monopsony rents of the plan by processing all of the raw material locally, then to the degree that the original processors are unable to find alternative (international) sources of supply, raw material processing would become more concentrated. I am currently gathering data on the production of key agricultural raw materials and plan to link these directly to the dispersion of processing in a later draft.

Table II: Trends in Product Coefficients of Variation (29 Provinces)

Statistically Significant Positive (+) and Negative (-) Time Trends

1981-1995						1988-1995					
Number of:		Unweighted		Weighted		Number of:		Unweighted		Weighted	
Observations	Products	+	-	+	-	Observations	Products	+	-	+	-
15	36	7	21	8	22						
≥ 12	55	10	34	11	31						
≥ 9	74	12	43	16	38	= 8	58	18	17	22	13
≥ 6	138	20	55	28	43	≥ 6	131	29	29	34	21
≥ 3	156	22	56	29	43	≥ 3	153	30	32	35	23

Average Annual Percentage Change in Product Coefficients of Variation
(36 Products with data for 1981-1995)

	81-82	82-83	83-84	84-85	85-86	86-87	87-88	88-89	89-90	90-91	91-92	92-93	93-94	94-95
Absolute	-3.7	-4.8	-3.5	-2.8	-3.6	-4.6	-2.8	2.9	-0.0	-1.2	-4.2	0.4	0.1	-4.6
Weighted	-3.5	-4.2	-3.1	-1.9	-2.6	-3.4	-3.0	1.4	-0.3	-0.9	-2.0	1.9	0.8	0.1

The products, listed by the number of observations and the significance of the 1981-1995 time trend on the absolute coefficient of variation, are:

Positive time trends: (15) Raw Coal, Sugar, Fertilizer (Nitrogenous), Fertilizer (Phosphate), Fertilizer (Potassium), Calcium Carbide, Sewing Machines; (14) Cigarettes/Cigars, Ferroalloys; (13) Gunnysacks; (11) Silk, Coke; (10) Coke (not machine-made)*; (9) Gasoline; (8) Washed Coal, Synthetic Ammonia, Tiles, Pumps, Mechanical Farming/Tillage Equipment, Large & Small Farm Tools; (7) Cloth Shoes, Large & Specialized Weighing Apparatus; (5) Offset Printing*, Aluminum Pots.

Negative time trends: (15) Crude Oil, Natural Gas, Crude Salt, Timber, Yarn, Cloth, Machine-made Paper & Paperboards, Electric Power (non-hydro), Sulfuric Acid, Soda Ash, Caustic Soda, Chemical Pesticides, Plastics, Chemical Fibres, Outer Tyres (motor vehicles), Cement, Bicycles, Watches, Motor Vehicles, Refrigerators, Televisions; (14) Canned Foods, Beer, Knitting Wool, Woolen (Piece) Goods, Ethylene/Vinyl, Daily Use Aluminum Products, Mining Equipment, Wristwatches*, Other Watches*, Cameras, Electric Fans, Synthetic Detergents, Radios; (13) Internal Combustion Engines; (11) Western (Chemical) Medicines, Synthetic Chemical Fibres*, Non-Synthetic Chemical Fibres*, Railway Locomotives, Passenger Cars, Trucks/Lorries, Colour Televisions*, Tape Recorders; (10) Leather Shoes, Machine-Made Coke*; (8) Iron Ore (Raw), Sulfered Iron Ore, Paper (not newsprint or printing plate)*, Plastic Products, Conveyers, Petroleum Cobalt Extraction Equipment; (7) Tap Water (supplied), Chemical Fibre Cloth*, Cloth (Natural & Mixed Fibres)*, Clothing, Diesel Oil, Kilowatt-hour Meters; (6) Clothing (Not-Leather)*, Polyvinyl Chloride Plastic Products*, Non-Polyvinyl Chloride Plastic Products*, Medical Apparatus & Instruments; (5) Enamel (Wash) Cups.

No significant time trend: (15) Hydropower, Plate Glass, Steel, Pig Iron, Rolled Steel Final Products, Metal Cutting Machine Tools, Large Tractors, Small Tractors; (14) Washing Machines, Lightbulbs; (13) Power Generating Equipment; (11) Silk Wooven Goods, Chinese (Herbal) Medicine, Freight Cars, Other Motor Vehicles*, Alternating Current Motors, B&W Televisions*; (10) Edible Vegetable Oil; (9) Non-Beer Alcoholic Beverages; (8) Iron Ore (Processed), Refractory Clay, Dairy Products, Newsprint*, Printing Plate Paper*, Paint, Dyes, Health (Bathroom) Ceramics, Bricks, Daily Use Ceramic Utensils, Daily Use Enamel Products, Industrial Boilers, Forging Equipment, Cranes, Mining Locomotives, Blowers, Gas Compressors, Rolling Bearings (not Ball), Smelting Equipment, Chemical Equipment, Motorcycles, Civilian (Steel) Boats, Motorized Fishing Boats, Direct Current Motors, Communications Cable; (7) Light Leather, Milled Lumber, Man-made Boards, Books & Periodicals Printing, Fountain Pens, Ball-point Pens, Kerosene/Paraffin, Coal Gas, Daily Use Glass Products, Metal Rolling Equipment, Transformers; (6) Phosphate Rock, Husked Rice, Sweets/Candy, Non-Alcoholic Beverages, Clothing (Leather)*, Heavy Leather, Wooden Furniture*, Furniture (not Wood)*; (5) Flour, Compound/Mixed Feed, Tanned Leather, Sculpture, Metal Artwork, Artwork Woven of Plant Materials, Paintings, Lacquerware, Drawnwork & Embroidery, Outer Tyres (man-powered vehicles), Enamel Washbowls, Electric Irons; (3) Embroidery*, Drawnwork*, Synthetic Rubber, Planting Equipment.

An asterisk denotes a subcategory. As I expand the sample to cover products with less observations, I substitute the subcategories for the broader product, e.g. "Wristwatches" and "Other Watches," with 12 observations each, for "Watches," with 13 observations. In compiling these data I have followed the Chinese definition of what constitutes an industrial product, e.g. including artwork and sculpture. Some products in the table appear to be repetitive, e.g. raw coal vs. washed coal. I have checked technical dictionaries to ensure that they represent genuinely differentiated output. For example, washed coal (xijingmei) is a type of processed coal meeting minimum standards concerning size and ash content.

while the weighted coefficients actually show a one a half to one preponderance of positive trends. The Table also lists the average, across the 36 products for which I have data in all years, of the annual log growth of the coefficient of variation. Again, these data illustrate the rapid convergence of the early 1980s and the weakening of this tendency at the turn of the decade. Overall, however, convergence was overwhelmingly dominant, with the average weighted and unweighted coefficient of variation falling 28% and 19%, respectively, between 1981 and 1995.

To complete this section, I move from provincial level data to the analysis of smaller geographic units, i.e., cities. Table III below presents the sum across 299 of the 324 official "cities" (in 1985) of the People's Republic of the absolute values of the deviations of the shares of light and heavy industry from the national average.[24] Every measure, whether of the gross or net (value added) output, whether in current or constant prices, and whether weighted (by the output share of each city) or unweighted, indicates some decline, usually on the order of 7.5%, in the sum of deviations between 1980 and 1985. While the numerical changes in the Table appear small, they are easily discerned visually. Figure VI orders the 299 cities by the share of light industry in the current value of industrial output in 1980, with the city with the highest share placed on the far left. This is the measure which, in Table III, evinces the *smallest* proportional decline. Nevertheless, comparing the solid line, depicting the share of light industry in 1980, with the dashed line, depicting light industry's share in 1985, one can a systematic relation, where cities with an initially large light industrial share tended to develop heavy industry, while cities which initially had little light industry developed that sector at the expense of their traditional strength in the heavy industrial sector.

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[24] These data are drawn from the 1985 Industrial Census, which did not present disaggregated light vs. heavy industrial output for the 14 open coastal cities, 4 special economic zones and 5 "separate planning" cities (*jihua danlie shi*). Further, in the case of two cities, industrial output was zero in 1980. Hence, the reduced sample of 299 out of 324 administratively delineated "cities." I take the sum of the available cities as my measure of the "national" structure. The data cover only the city districts, not the counties in which cities reside, and are restricted to independent accounting units. The output of the independent accounting enterprises in the 299 cities I examine accounted for 40% of the current value of national industrial output in 1985.

Table III: Convergence of the Industrial Structure of 299 Cities (Independent Accounting Enterprises only)						
Sum of Deviations from National Share of Light and Heavy Industry						
	Gross Output				Net Output	
	Constant Prices		Current Prices		Current Prices	
	Absolute	Weighted	Absolute	Weighted	Absolute	Weighted
1980	136.2	113.5	133.0	112.7	145.4	123.7
1985	126.1	104.9	126.8	105.1	135.2	114.4

Figure VI: Output Share of Light Industry
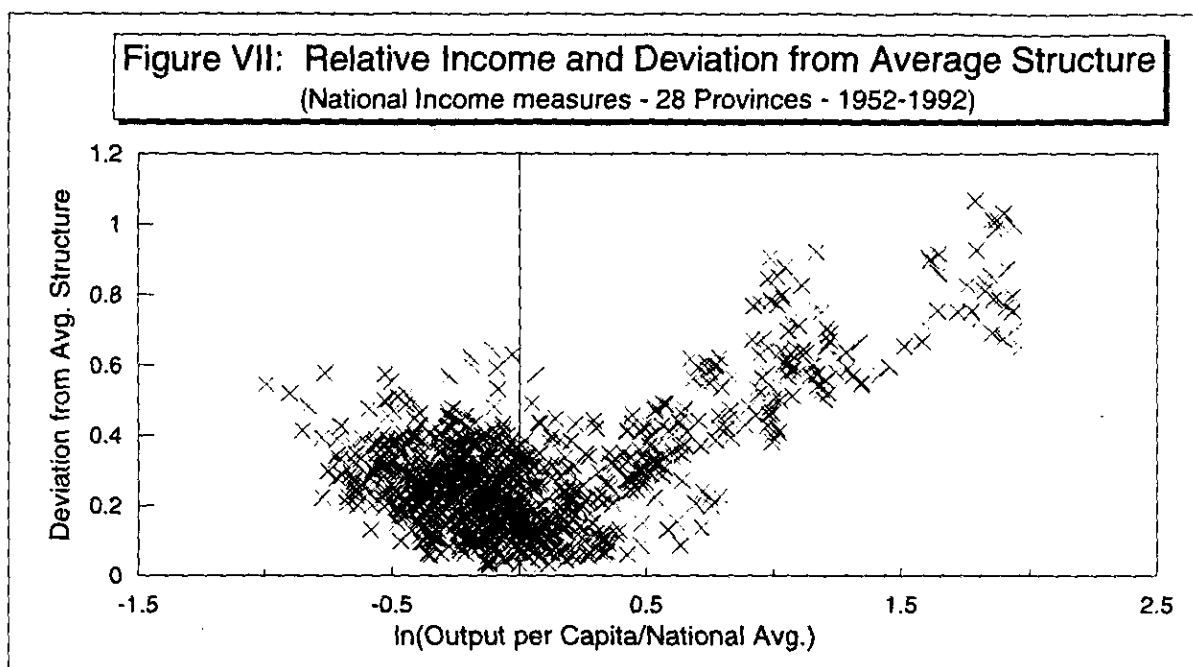(Current Prices, 299 cities, ordered by 1980 share)
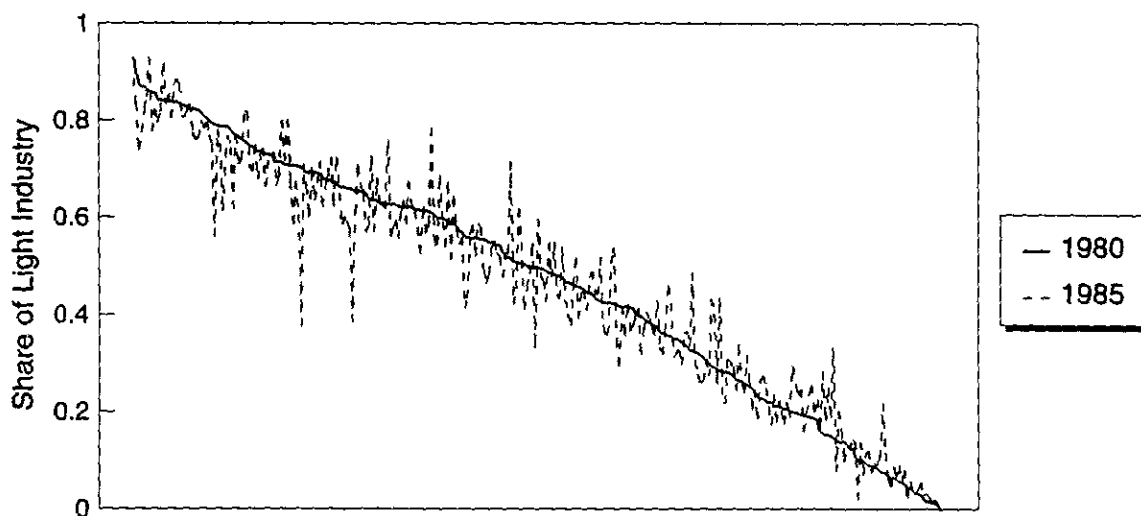
IV Explanations

A) Convergence of income

One might argue that the convergence in structure chronicled earlier in section III is merely an outcome of convergence in income levels. Perhaps as poorer provinces have caught up with their richer neighbours their factor endowments, productivity levels and, by extension, patterns of comparative advantage and production have come to resemble those of their wealthier compatriots. Alternatively, putting aside changes in comparative advantage, as relative income levels have converged the structure of demand within provinces might similarly have converged which, in the presence of transport costs which increase with the volume of trade, would have led to a convergence in the structure of production. Thus, for reasons of both demand and supply, a convergence of income levels would naturally lead to a convergence in the structure of production.

Figure VII below graphs the annual deviation of the structure of provincial output from the national average against the natural log of the ratio of provincial income per capita to average national income per capita for each of the 28 provinces and 41 years used in the national income series displayed earlier in Figure II. As indicated by the Figure, there appears to be a fairly systematic relation between a deviation from the national average in the level of income and a deviation from the average structure of production. The variance of the log ratio graphed on the x-axis of the Figure, at .29 in 1952 and .33 in 1978, had fallen to .23 by 1992. Thus, while it seems unlikely to explain convergence in the pre-reform era, there is a basis for believing that convergence in income levels during the reform period might explain some of that period's convergence in the structure of production. Other moments of the income distribution, however, tell a different story. For example, the mean of the absolute value of the log ratio of provincial to national income per capita, at .37 in both 1952 and 1978, was virtually unchanged, i.e. .38, in 1992. Thus, to the degree that the relationship depicted in Figure VII is linear, it could not have

Figure VII: Relative Income and Deviation from Average Structure
(National Income measures - 28 Provinces - 1952-1992)

contributed to convergence in the structure of production during the reform period.

Table IV regresses the provincial deviations from the average structure of production against various moments of the provincial income distribution, estimating separate slope coefficients for positive and negative deviations from the average income.[25] Focusing first on the analysis using the national income measures, column (1) finds, not surprisingly, a highly significant linear relation between the log of relative provincial income and deviations from the average structure. Columns (2) and (3) bring in the second moment of the income distribution. Only negative squared deviations are significant, and then only when time dummies are introduced. Taking equation (3) as the estimated relation, of the 1.21 point decline in the sum of the provincial deviations from the average production structure between 1978 to 1992, only 0.004 points can be explained by changes in the distribution of income, with the remainder of the decline

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[25] With the exception of the analysis using provincial dummies (further below), the data overwhelmingly reject the null that the slope coefficients are the same.

Table IV: Deviation from Average Production Structure as Determined by Deviations from Average Income per Capita								
Independent Variables:	Dependent Variable: Dev_{it}							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Inc-pos$_{it}$	.362* (41.6)	.328* (12.0)	.347* (13.2)			-.090** (-2.4)		
Inc-neg$_{it}$	-.267* (-13.9)	-.341* (-6.3)	-.383* (-7.3)			-.012 (-0.2)		
Inc-pos2$_{it}$		.026 (1.6)	.014 (0.9)	.213* (38.9)	.575* (23.5)	.094* (3.9)		
Inc-neg2$_{it}$		-.149 (-1.7)	-.195** (-2.4)	.268* (8.4)	.705* (6.7)	.035 (0.4)		
Inc-pos3$_{it}$					-.214* (-15.1)			
Inc-neg3$_{it}$					.542* (3.5)			
Inc$_{it}$							-.045 (-1.5)	
Inc2$_{it}$							.076* (3.4)	.051* (3.4)
Annual Dummies			Yes*	Yes*	Yes*	Yes*	Yes*	Yes*
Provincial Dummies						Yes*	Yes*	Yes*
R^2	.605	.607	.656	.601	.670	.821	.820	.820

Definitions: (*) Significant at the 1% level; (**) Significant at the 5% level. Dev_{it} = absolute deviation from the average structure of national income by province i in year t, as estimated in Figure II earlier. Regarding the independent variables, let I_{it} equal the natural log of the ratio of provincial income per capita to national income per capita. Then, Inc-pos$_{it}$ = I_{it} if I_{it} exceeds 0, zero otherwise; Inc-neg$_{it}$ = I_{it} if I_{it} is less than 0, zero otherwise; Inc-pos2$_{it}$ = the square of Inc-pos$_{it}$; Inc-neg2$_{it}$ = the square of Inc-neg$_{it}$; Inc$_{it}$ = the absolute value of I_{it}; Inc2$_{it}$ = the square of Inc$_{it}$. N = 28 provinces x 41 years = 1148 observations.

accounted for by the time dummies.[26] To heighten the impact of income distribution, column (4) removes the linear terms from the regression. Doing so allows the coefficients on income to account for slightly under half (0.57 points) of the decline between 1978 and 1992. Introducing cubic terms, however, as in column (5), reduces the estimated impact of changes in income distribution to -.12 points, as the regression uses the cubic terms to linearize the relation. Thus, up to this point, the overwhelming evidence is in favour of a linear relation with changes in the distribution of income accounting for only a small fraction of the convergence in the structure of production.

Column (6) of Table IV introduces provincial dummies, which essentially turn the regression from one of levels into one of differences. In differences, the elegant relationship depicted in Figure VII is destroyed, as the coefficients on the income terms become insignificant or nonsensical, e.g. implying that, at least initially, an increase in income relative to the average leads to a production structure more similar to the average. With the provincial dummies, however, one cannot reject the null that the slope coefficients in different orthants are the same (mostly because the standard errors on terms from the negative orthant are now so large). Further, with the coefficients in different orthants constrained to be the same, one finds that linear deviations are far less significant that squared deviations (column 7). Thus, in the interest of maximizing the explanatory power of changes in the income distribution, one could settle on column (8), which relates the deviation in structure to the second moment of the income distribution. Even based upon this equation, however, one would conclude that only 12% (.14 points) of the 1.2 point decline in the sum of deviations from the average production structure between

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[26] Put differently, there is a highly significant negative time trend.

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1978 and 1992 was explained by changes in the distribution of income.[27]

In sum, while there appears to be a fairly significant relation between income distribution and deviations from the average structure, the data strongly suggest that changes in the income distribution account, at best, for only a small fraction of the changes in the dispersion of production. One might wonder, however, whether endogeneity bias limits the type of conclusions one can draw from regressions such as those in Table IV. Clearly, relative income is determined by relative productivities and relative factor allocations, which also determine patterns of comparative advantage and, by extension, deviations from the average production structure. Thus, relative income is an endogenous variable which is correlated with the error term. It is precisely this endogeneity, however, that the regressions seek to capture, and hope is maximized. To the degree that changes in patterns of comparative advantage are orthogonal to changes in the dispersion of income, but nevertheless result in changes in the dispersion of production, the regressions fail to capture the influence of these important variables. In the next section I address, more directly, issues of comparative advantage.

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[27] Regarding GDP measures of income and structure, the estimated relations are fairly similar. However, while the square of the natural log of the ratio of provincial GDP per capita to the national average fell from .33 to .26 between 1978 and 1995, during the same period the mean of the absolute value of the log ratio actually rose, from .37 to .43. Thus, running regressions using GDP measures of income and deviations from the average structure (as estimated in Figure II earlier), I find, that the linear and and squared income distribution terms together, in the equivalent of column (3) above, actually imply a .24 point *increase* in the sum of provincial deviations from the average production structure between 1978 and 1995. Even when using only squared terms, the equivalent of column (4) above, changes in the income distribution still only account for .24 points of the 1.86 point decline in the sum of provincial deviations from the average structure between 1978 and 1995. Allowing for cubic terms, as in column (5), once again linearizes the relation and indicates that changes in the distribution contributed to a .22 point increase in the deviation from the average structure. Finally, with provincial dummies, and constraining the relation to be symmetric around the y-axis, squared terms dominate the regression. Even so changes in income distribution, in the equivalent to column (8) above, account for only .22 points of the 1.86 point decline in the sum of deviations between 1978 and 1995. I should note that the GDP regressions are restricted to the post-1978 period. Thus, they help address the issue of whether a restricted estimate of the relationship between income dispersion and the deviation from the average, using data outside of the plan period, does better in explaining the convergence in the structure of production. It does not.

B) Specialization and Comparative advantage

A simple variance decomposition provides some insight into the forces driving convergence in the structure of production in the People's Republic. Consider the variation in the log of the ratio of the output of two sectors, i and j. This variation can naturally be decomposed into the variance of relative labour productivities, the variance of relative labour allocations, and the covariance between the two, i.e.

$$(1) \quad \mathrm{Var}\left[\ln\left(\frac{Q_i}{Q_j}\right)\right] = \mathrm{Var}\left[\ln\left(\frac{Q_i/L_i}{Q_j/L_j}\right)\right] + \mathrm{Var}\left[\ln\left(\frac{L_i}{L_j}\right)\right] + 2\,\mathrm{Cov}\left[\ln\left(\frac{Q_i/L_i}{Q_j/L_j}\right),\ln\left(\frac{L_i}{L_j}\right)\right].$$

Thus, to provide some interpretation, convergence in structure might reflect a convergence in patterns of comparative advantage, a convergence in factor allocations or a weakening of the trade-induced link between patterns of comparative advantage and factor allocations. Before applying this decomposition, it is worth exploring the theoretical basis for its interpretation in some detail.

As first noted by Ford (1967), and later generalized by Falvey (1981), the link between patterns of comparative advantage and the average product of labour is by no means restricted to the Classical (Ricardian) model alone. Consider a Heckscher-Ohlin world with two sectors and capital and labour as the two factors of production. Absent technologicial change, an increase in labour productivity in sector i can only be brought about by an increase in the capital-labour ratio which, in turn, is related, by the elasticity of substitution, to changes in the wage-rental ratio:

$$(2) \quad \hat{q}_i = \theta_K^i \hat{k}_i \qquad \hat{k}_i = \sigma_i(\hat{w} - \hat{r}),$$

where hats denote proportional changes and θ_K^i the sectoral share of capital. If the elasticity of substitution is the same across sectors (or, more precisely, is not higher in labour intensive sectors), intersectoral differences in output per worker will be systematically related to changes in the wage-rental ratio:

$$(3) \quad \hat{q}_i - \hat{q}_j = (\theta_K^i - \theta_K^j)\,\sigma\,(\hat{w} - \hat{r}).$$

If factor price equalization holds, all economies share the same relative labour productivities. If, however, there are trade barriers or transport costs, and these are increasing in the volume of trade, then economies endowed with more capital will have higher wage-rental ratios. It follows, from (3), that if sector i produces the capital intensive good, the average product of labour in sector i relative to sector j will be higher in economies in which capital is abundant, i.e. economies whose comparative advantage lies in capital intensive goods.

The extension of this analysis to the decomposition presented above is fairly simple. Consider two exercises, one in which trade barriers are increased and another in which, for given levels of trade barriers, the variation of capital-labour ratios (i.e. dispersion of comparative advantage) is reduced. To begin with the first, as trade barriers increase the elasticity of demand in each economy (initially, with free trade, infinite) falls. Economies which are capital (labour) abundant will, at any given price ratio, have greater relative supplies of the capital (labour) intensive good. As the elasticity of demand falls, the relative price of this good within the economy falls, reducing its output relative to the output of the good in which the economy does not have a comparative advantage. Thus:

> (A) An increase in trade barriers leads to a convergence in the structure of production, reducing the variance (across the sample) of relative outputs.

As the relative price of capital intensive goods falls in capital abundant economies and rises in labour abundant economies, it raises the wage-rental ratio in the former and lowers it in the latter. It follows, from (3), that:

> (B) An increase in trade barriers raises the relative productivity of labour in the sector in which economies have a comparative advantage, increasing the overall variance (across the sample) of relative labour productivities.

The economy-wide capital labour ratio equals the sum of the capital-labour ratios of each sector, weighted by their shares of the total labour force:

$$(4) \quad K/L = (K_i/L_i)(L_i/L) + (K_j/L_j)(L_j/L)$$

As the wage-rental ratio rises (falls) in capital (labour) abundant economies, the capital-labour ratio in each sector rises (falls). From (4), one can see that this systematically reduces the allocation of labour to the sector in which the economy has a comparative advantage. In the limit, if the effective elasticity of demand falls below the elasticity of substitution in production, labour allocations can become perverse, with more of this factor allocated to the sector in which the economy does not have a comparative advantage. Thus:

> (C) An increase in trade barriers reduces the allocation of labour to the sector in which an economy has a comparative advantage, reducing the variance of labour allocations when these are biased in favour of comparative advantage and increasing it when labour allocations have become perverse. The covariance between labour allocations and relative productivities initially increases (from zero), as the variance of relative productivities rises, but then begins a monotonic deterioration, becoming negative once factor allocations are perverse.

Consider now a second exercise, reducing, for given levels of trade barriers, the interregional dispersion of capital-labour ratios (the dispersion of comparative advantage). As the economy-wide capital-labour ratio falls in capital abundant economies, the output of the capital intensive good falls, raising its relative price. The rise of the relative price of the capital intensive good increases its production, but, unless demand is completely inelastic, this increase does not completely offset the initial supply response. Applying similar reasoning to labour abundant economies which experience a rise in the capital-labour ratio, it follows that:

> (a) A reduction in the dispersion of comparative advantage leads to a convergence in the structure of production, reducing the variance (across the sample) of relative outputs.

As the price of the capital intensive good rises in capital intensive economies and falls in labour intensive economies, the wage-rental ratio falls in the former and rises in the latter. From (3), this tends to lower the relative productivity of labour in the capital intensive sector (where it is initially higher) in capital abundant economies and raise it in labour abundant economies (where it is initially lower). Consequently:

> (b) A reduction in the dispersion of comparative advantage systematically reduces the relative productivity of labour in sectors in which it was already relatively high, lowering the overall variance (across the sample) of relative labour productivities.

Finally, regarding labour allocations, from (4) one can see that the initial drop in the capital-labour ratio in capital abundant economies requires, at given prices, a movement of labour away from the sector in which the economy has a comparative advantage. The reduced supply of capital-intensive goods, however, raises their price and lowers sectoral capital-labour ratios implying, from (4), a movement of labour back into the capital intensive sector. It is easily shown that whether or not the net effect is positive or negative depends upon whether the effective elasticity of demand is less than or greater than the elasticity of substitution in production, i.e. on whether labour allocations are initially biased against or in favour of the capital intensive sector. It follows that:

> (c) A reduction in the dispersion of comparative advantage lowers the absolute value of the covariance between labour allocations and relative labour productivities, moving it toward zero. Further, the variance of labour allocations falls.

The results outlined above are actually considerably more general than the Heckscher-Ohlin model with equal technologies used in their derivation. Specifically, they are reasonably robust to an allowance for factor specificity (the Specific Factors Model), non-homothetic demand (provided no good is "too" inferior), and differences in technologies as determinants of comparative advantage. Basically, trade barriers convert the superiority of relative quantity supplies at world prices (comparative advantage) into a movement toward higher relative labour productivities, while, incidentally, breaking the link between these productivities and relative factor allocations. Consequently, as summarized in Table V, increases in trade barriers reduce the variance of relative outputs, tend to increase the variance of relative productivities,[28] reduce or increase the variance of labour allocations depending upon whether these favour or are biased

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[28] When one allows for differences in total factor productivity as determinants of comparative advantage it is possible, if $\sigma > 1$, for the relative productivity of labour in sector i to be lower (at world prices) in the economy which has a comparative advantage in that product. In that case, as trade barriers increase the relative productivity of industries in which an economy has a comparative advantage, they actually reduce the variance of relative productivities, as indicated in the Table. For sufficiently large barriers to trade, however, relative labour productivity becomes higher in the economy with the comparative advantage in that product and the variance of relative productivities is, thereafter, monotonically increasing in barriers to trade.

Table V: Decomposing the Influence of Changes in Trade Barriers and Patterns of Comparative Advantage			
	Variance		Covariance
	$\ln\left(\dfrac{Q_p}{Q_s}\right)$	$\ln\left(\dfrac{Q_p/L_p}{Q_s/L_s}\right)$	$\ln\left(\dfrac{L_p}{L_s}\right)$ $\ln\left(\dfrac{Q_p/L_p}{Q_s/L_s}\right),\ \ln\left(\dfrac{L_p}{L_s}\right)$
↑ trade barriers or transport costs	↓	↓ initially (possible if σ > 1), then ↑	↓ initially, ↑ once allocations perverse ↑ initially (possibly), then monotonically ↓ (esp. when allocations perverse)
↓ variance of comparative advantage	↓	↓	↓ absolute value ↓
Note: σ = elasticity of substitution in production.			

against pattterns of comparative advantage and, most importantly, tend to reduce the covariance between relative sectoral productivities and labour allocations. In contrast, for given trade barriers a reduction in the dispersion of comparative advantage tends to make all economies more similar, reducing the variance of relative outputs, relative productivities and relative allocations, and driving the covariance between productivities and factor allocations toward zero. Since these results hold for a wide class of models, they provide a useful analytical shortcut. Instead of committing to a particular modelling structure, specifying and measuring (hopefully accurately) the determinants of comparative advantage and then, finally, estimating intertemporal changes in their relation to outputs, one can move directly to the decomposition outlined in equation (1) earlier, using it to draw inferences on changes in trade barriers/transport costs or in the dispersion of comparative advantage.

Analytical simplicity is, unfortunately, not purchased without cost. While all of the results listed above apply on a univariate basis, they can be confounded by multivariate determinants of comparative advantage. Formally, aspects of the preceeding discussion could be summarized by the following system of equations:

(5) $\ln Q_{i-j} = \alpha \cdot X$, $\ln Y_{i-j} = \beta \cdot X$,   and $\ln L_{i-j} = \gamma \cdot X$.

where X is a vector of exogenous determinants of comparative advantage (plus a constant), the greek letters denote coefficient vectors, and Q_{i-j}, Y_{i-j}, and L_{i-j} are an economy's output, labour productivity and labour allocation, respectively, in sector i relative to sector j. The preceeding discussion, and more formal analytics, easily establishes results such as $\partial\alpha/\partial\varepsilon < 0$, $\partial\beta/\partial\varepsilon > 0$, and $\partial\gamma/\partial\varepsilon < 0$ where ε is a measure of trade barriers or transport costs. Similarly, it is not hard to see, looking at (5), why the variance of each endogenous variable is decreasing in the variance of each of the x_i's. The multivariate framework, however, allows one to destroy the clarity of the univariate results. For example, if the variance of x_1 rose, while the variance of x_2 declined, it would be possible for the variance of relative outputs to fall, while the variance of relative productivities rose. This would constitute a case where changes in comparative advantage produced results that, as per Table V, I would ascribe to changes in trade barriers. Although one can rule out some perverse possibilities in some analytical structures, one cannot exclude these outcomes for all models and all parameter values. Generally, however, perverse results require an extremely strong negative covariance between the determinants of comparative advantage (or in their changes) so that while one factor pulls the endogenous variables in one direction, the other pulls in the opposite (but not equal) direction.[29]

Table VI below performs the variance decomposition for the output of primary vs. secondary industry (two predominantly tradeable sectors) in 26 provinces during the reform period. The Table uses both 1978 and 1992 prices as weights in the analysis and, with the exception of the variance of relative outputs, which falls less at earlier prices, the qualitative nature of

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[29] I should note, further, that all of the results outlined in the text concern real outputs. Consequently, in Table VI further below I focus on changes in outputs and productivities at constant prices. This still leaves the problem of initial prices and their covariance with subsequent output changes. To work around this, I present the results using different base years. The model described above also has implications for movements in relative prices, which I hope to explore further in a later draft. I am still working out the analytics of these, and other, issues. It is my intent to prepare an appendix providing a full analytical description of the models discussed in the text above, allowing for sector specific or mobile factors, non-homothetic demand and differences in sectoral total factor productivities.

Table VI: Analysis of Variance

National Income - Primary vs. Secondary Industry

	26 Provinces							12 Provinces						
	Variance					Covariance		Variance					Covariance	
	$\ln\left(\frac{Q_P}{Q_S}\right)$		$\ln\left(\frac{Q_P/L_P}{Q_S/L_S}\right)$		$\ln\left(\frac{L_P}{L_S}\right)$	$\ln\left(\frac{Q_P/L_P}{Q_S/L_S}\right),\ \ln\left(\frac{L_P}{L_S}\right)$		$\ln\left(\frac{Q_P}{Q_S}\right)$		$\ln\left(\frac{Q_P/L_P}{Q_S/L_S}\right)$		$\ln\left(\frac{L_P}{L_S}\right)$	$\ln\left(\frac{Q_P/L_P}{Q_S/L_S}\right),\ \ln\left(\frac{L_P}{L_S}\right)$	
	1978 Prices	1992 Prices	1978 Prices	1992 Prices		1978 Prices	1992 Prices	1978 Prices	1992 Prices	1978 Prices	1992 Prices		1978 Prices	1992 Prices
1952								1.02	0.93	0.36	0.30	0.76	-0.05	-0.07
1957								1.04	0.98	0.33	0.32	0.61	0.05	0.02
1962								0.84	0.79	0.16	0.16	0.57	0.06	0.03
1965								0.74	0.66	0.14	0.07	0.59	0.01	-0.00
1970								0.65	0.59	0.13	0.08	0.59	-0.03	-0.04
1975								0.79	0.73	0.15	0.10	0.65	-0.00	-0.01
1978	0.59	0.56	0.12	0.11	0.50	-0.01	-0.02	0.70	0.64	0.17	0.14	0.71	-0.09	-0.10
1980	0.61	0.58	0.10	0.09	0.61	-0.05	-0.06	0.71	0.65	0.14	0.10	0.74	-0.09	-0.10
1982	0.58	0.55	0.10	0.09	0.65	-0.08	-0.09	0.69	0.64	0.12	0.09	0.76	-0.09	-0.10
1983	0.55	0.49	0.14	0.12	0.68	-0.14	-0.15	0.69	0.60	0.18	0.13	0.80	-0.15	-0.17
1984	0.51	0.46	0.13	0.12	0.73	-0.17	-0.19	0.63	0.54	0.15	0.12	0.82	-0.17	-0.20
1985	0.61	0.53	0.10	0.08	0.65	-0.07	-0.10	0.73	0.63	0.11	0.08	0.74	-0.06	-0.10
1986	0.57	0.49	0.10	0.08	0.67	-0.10	-0.13	0.73	0.61	0.11	0.08	0.79	-0.08	-0.13
1987	0.55	0.48	0.10	0.09	0.69	-0.12	-0.15	0.73	0.62	0.11	0.09	0.83	-0.10	-0.15
1988	0.51	0.43	0.12	0.10	0.71	-0.16	-0.19	0.70	0.59	0.11	0.10	0.88	-0.15	-0.20
1989	0.51	0.44	0.11	0.10	0.73	-0.17	-0.20	0.70	0.61	0.10	0.11	0.93	-0.16	-0.22
1990	0.51	0.43	0.16	0.13	0.76	-0.20	-0.23	0.69	0.56	0.17	0.16	0.95	-0.22	-0.27
1991	0.53	0.43	0.16	0.13	0.76	-0.20	-0.23	0.72	0.58	0.16	0.15	0.99	-0.21	-0.28
1992	0.54	0.43	0.17	0.14	0.80	-0.22	-0.26	0.74	0.58	0.19	0.18	1.07	-0.26	-0.34

Gross Output - Light vs. Heavy Industry (297 cities)

	1980 Prices	1985 Prices	1980 Prices	1985 Prices		1980 Prices	1985 Prices
1980	1.87	1.91	0.32	0.33	1.20	0.18	0.19
1995	1.60	1.64	0.26	0.27	1.14	0.10	0.12

Notes: 26 provinces = all but Tianjin, Zhejiang, Hainan & Tibet. 12 provinces = Jilin, Heilongjiang, Shanghai, Jiangxi, Henan, Hunan, Guangdong, Sichuan, Guizhou, Yunnan, Qinghai, & Ningxia. 297 cities = as per Table III above, with two cities removed because they had zero output in one sector or the other.

the results is unaffected by the choice of weights. As the reader can see, both the variance of relative productivities and the variance of labour allocations rose during the sample period, while the covariance of productivities and allocations fell dramatically. These results are not compatible with a decreasing dispersion of patterns of comparative advantage, or even an increasing dispersion, since this would imply a rapidly rising variance of relative outputs. They are, however, precisely what is implied by a rise in transport costs or trade barriers. A smaller sample of 12 provinces provides a longer historical perspective. Here, we see that up until 1962 convergence in the structure of output seems to have been associated with a declining variance of relative productivities and factor allocations, and an improving covariance, results that might be driven by a falling dispersion of comparative advantage coupled, perhaps, with some fall in transport costs. Beginning in 1962, however, we see, as in so many cases in this paper, the beginning of trends which carry through into the reform period: a rising variance of relative productivities and factor allocations and a deteriorating covariance between the two. Thus, the changes that occurred in the economy during a period of forced industrial diversification paradoxically seem to have continued during its "movement to market". At 1992 prices, the correlation between relative productivities and factor allocations in the 26 province sample, -.08 in 1978, had fallen to -.78 by 1992.

Table VI also presents the variance decomposition for the gross output of light and heavy industries in the 297 cities examined earlier in Table III. Here we see that convergence in the structure of production has been associated with a fall in the variance of relative productivities and factor allocations and a weakening of the covariance between the two. These results are generally incompatible with rising trade barriers and are much more plausibly related to simple convergence in patterns of comparative advantage. If one regresses the growth of output per worker in light or heavy industry on its initial value, one finds a significant negative coefficient. While trade barriers may have risen across this sample, their effect is clearly dominated by the convergence in patterns of comparative advantage. This sample, however, excludes rural indus-

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try. Thus, as a test of patterns of factor allocation, it excludes the main body of entrants (i.e. industrial rent seekers) during the reform period.

The preceeding paragraph touches on an important issue: the interpretation of the variance decomposition performed in Table VI is very specific to the universe of economies and sample of products. In particular, the results, indicating rising interprovincial trade barriers in agriculture vs. manufacturing, are completely compatible with an overall opening of the economy and an overall movement of comparative advantage toward manufactures. Thus, to explore the first issue, imagine that there is a domestic relative price P_P^D/P_S^D which, initially, is distorted away from the world price P_P^W/P_S^W by national tariff barriers. Later, national tariff barriers are removed and P_P^D/P_S^D goes to the world relative price. Interprovincial barriers, however, rise, so that provincial prices now deviate more from P_P^D/P_S^D. While the overall specialization of the economy, vis-a-vis the world, improves, its internal specialization deteriorates, producing results such as those chronicled in Table VI.

C) Transport constraints

The deteriorating covariance between labour allocations and labour productivities chronicled in the previous section suggests that China's provinces are becoming, at least vis-a-vis each other, increasingly autarkic. The collapse of specialization, ascribed in this paper to the industrial arbitrage of the reform period and the trade wars it engendered, could, however, just as easily be explained by rising internal transport costs. A recurrent theme in popular press articles on China is the argument that the People's Republic is woefully short of transport infrastructure. It is possible that the extraordinary growth of output during the reform period has placed impossible demands on the nation's infrastructure, leading to a rising relative price of transport.
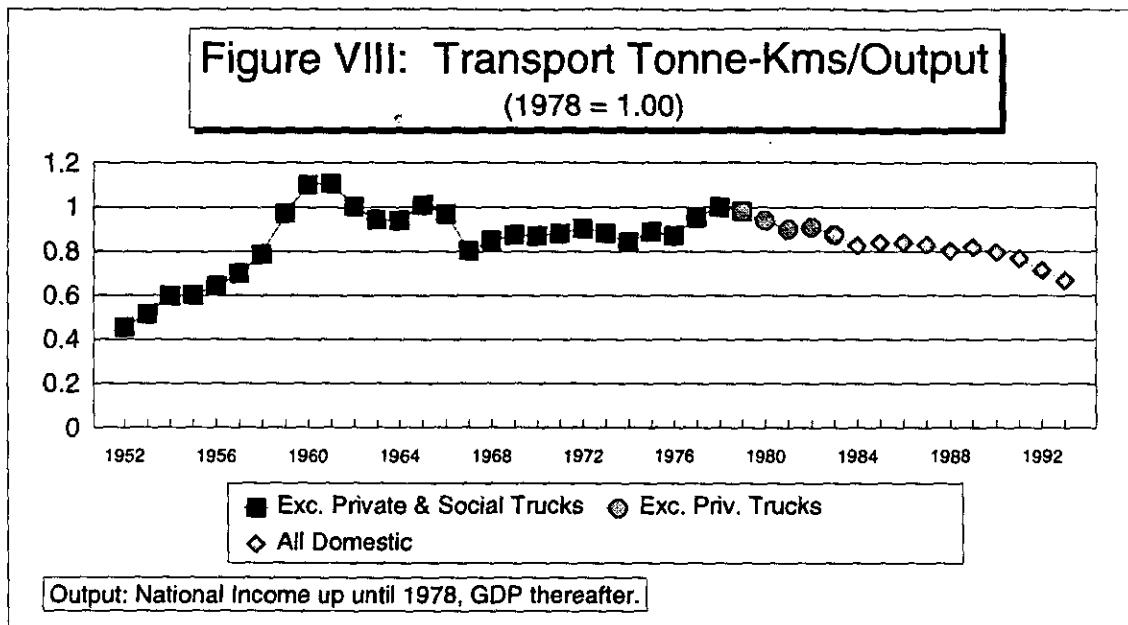
Figure VIII: Transport Tonne-Kms/Output
(1978 = 1.00)

Legend:
■ Exc. Private & Social Trucks ◉ Exc. Priv. Trucks
◇ All Domestic

Output: National Income up until 1978, GDP thereafter.

Figure VIII above presents data on the ratio of total tonne-kilometres of internal freight movement to output in the People's Republic.[30] As the reader can see, this ratio, which remained roughly constant from 1959 to 1978, went into decline during the reform period, reaching 63% of its 1978 value in 1993. Believers in the transport constraint hypothesis might find comfort in these data. Unfortunately, so could those who would argue that internal trade barriers have led to a collapse of interregional trading relations. Put differently, given the competing hypotheses, there is little one can infer about the relative price of transport from data on equilibrium quantities. Unfortunately, a direct examination of transport prices is not particularly informative. Most

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[30] In 1979 highway tonne-kms, previously covering the transport department alone, were expanded to include "social trucks" and in 1984 expanded again to include private trucking. I chain link the different series, as shown in the Figure. In constructing my index I exclude ocean shipping (*yuanyang yunshu*, shipped an average distance of 7300 kms in 1993) which in Chinese statistics is a category distinct from coastal shipping (*yanhai yunshu*). Hence, my use of the terminology "internal freight". In an appendix, available upon request, I use a methodology suggested by Chen (1994) and Kumar (1994), focusing on the interprovincial purchases and sales of state and agricultural supply commercial firms, to estimate the volume of interprovincial trade. These data suggest a rapid decline in interprovincial trade relative to total purchases and sales during the reform period. The measures of internal trade are problematic, however, as they are limited to the interprovincial transactions of state and agricultural firms with other such firms (alone).

transport in the People's Republic is run by government authorities and their prices are not likely to reflect the true cost of using transport facilities, given a shadow price for shipping delays and negotiations with government agencies.[31] Consequently, to address the issue of transport constraints, I will rely on a heuristic examination of transport capacity and the composition of transport demand.

Table VII below presents data on Chinese railway and waterway traffic and system assets. While trucking grew rapidly during the reform period, as late as 1993 these two modes of tranport still accounted for 56% and 22%, respectively, of total tonne-kilometres of internal freight movement. As the reader can readily see, the growth of both tonne and passenger kilometres in railways and waterways far exceeds that of simple measures of transport capacity, such as kilometres of operational railways or inland waterways. The quality of infrastructure, however, has improved dramatically with the number of electrified stations and length of electric track, diesel engine routes and automatic switching rising as fast, if not frequently faster, than total cargo shipped. Similarly, while the growth of the total number of locomotives was moderate, its composition has shifted away from steam to diesel and electric locomotives which, in 1993, on average moved twice as many tonne-kilometres of freight per day. In waterways, we see a rapid rise in total haulage capacity, with a substantial shift away from sail boats and barges to motorized vessels.

If demand has dramatically outpaced the growth of transport capacity, one would expect to find evidence of increasing delays in the shipment of goods. To this end, Table VIII presents indicators of delays in railway transport. As the Table shows, there has been no significant

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[31] For what its worth, between 1984 and 1994 railway freight revenue per tonne-km of freight movement rose 4.2% per annum, while passenger revenue per passenger-km of passenger transport rose 9.8% per annum. During the same period the overall GDP deflator rose 9.0% per annum. Between 1978 and 1995 the implicit GDP deflator for transportation, postal and telecommunications services rose 7.9% per annum, more than the overall GDP deflator (6.9%) and the deflator for industry (4.6%), but less than the deflator for construction (9.0%) and primary industry (9.5%) and on a par with the deflator for commerce (7.7%). CSY 1986 (p. 393) and 1995 (pp. 32, 468-469, and 478).

Table VII: Chinese Railway and Waterway Traffic and System Assets							
Railways	1978	1993	% ↑	Waterways	1980	1993	% ↑
Tonne-kms (100 million) Passenger-kms (100 million)	5345 1093	11955 3483	5.4 7.7	Tonne-kms (100 million) Passenger-kms (100 million)	5053 129	13861 196	7.8 3.2
Operational Railways (km) % Double Track % Electrified % Diesel Engine Routes % Automatic Switching	48618 15.7 2.1 13.5 12.3	53802 26.6 16.6 35.8 22.7	0.7 4.2 14.4 7.2 4.8	Inland Waterways (km) Deeper than one metre.	108508 53899	110174 61395	0.1 1.0
Electrified Stations % of Stations	1336 27.7	4194 73.9	7.6 7.6				
Locomotives % Steam % Diesel % Electric Freight Capacity (10,000 tn)	10179 79.0 18.9 2.2 1230	14781 36.3 48.8 14.9 2238	2.5 -2.7 8.8 15.3 4.0	Haulage Capacity (10,000 tn) Motor Vessels Barges Sailing Boats	1994 1279 595 120	4366 3468 889 8	6.0 7.7 3.1 -20.7
Passenger Cars	14844	29395	4.6	Passenger Capacity (10,000)	65	117	4.6

Notes: Growth rates represent the annual growth of the absolute number in each category, even if the category is listed as a percent of a larger total. Source: CSY 1994.

| Table VIII: Technical Indicators of Railway Transportation			
		1984	1993
On-Time Starts (%):	Freight Trains Passenger Trains	92.2 99.2	94.0 99.0
Running on Schedule (%):	Freight Trains Passenger Trains	90.1 94.7	93.1 90.0
Running Speed (kms/hr):	Freight Trains Passenger Trains	27.7 43.2	30.0 48.1
% of technical speed	Freight Trains Passenger Trains	64.7 79.4	67.4 83.1
Daily Distance (kms):	Freight Locomotives Passenger Locomotives	408 445	420 493
Handling Time of Freight (hrs): Transfer Waiting Time per Car (hrs):		14.1 3.9	17.3 4.3
Sources: CSY 1986 & 1994.			

decline in on-time starts and, with the exception of passenger trains, no fall off in the number of trains running on schedule. Travelling speeds have risen (even relative to technical speeds), as have daily distances travelled. The only negative data appear in the handling time of freight and transfer waiting time per carload of freight, measures of the time necessary to load freight cars and transfer them, en route, from one locomotive to another. Overall, these data do not seem suggestive of an economy strangled by infrastructural bottlenecks. While the growth of freight and passenger transport during the reform period has been rapid, the growth of the quality of infrastructural capital, as suggested by the data in Table VII earlier, has also been quite rapid. It would seem that, on average, capacity has grown apace with actual usage.

The argument that transport constraints explain the collapse of specialization in the People's Republic ignores a crucial geographical fact: 55% of China's GDP (in 1993) was produced by its 11 coastal provinces. Figure IX below shows the rise of China's external trade to GDP ratio during the reform period. Starting at 10% in 1978, the ratio of merchandise trade to GDP had risen to 44% by 1994. The port capacity and carriers (international and domestic) used to service the growing volume of international trade could easily have been used, via coastal shipping, to handle domestic trade between China's coastal provinces. Table IX presents data on tonne-kilometres of internal shipments per *yuan* of output (at 1992 prices) in the coastal provinces and the interior. While both the inland and coastal provinces experienced a decline in this ratio, by far the greater decline occurred in the coastal provinces, which (using divisia weights) accounted for 96% of the decline in the national average! Given the extraordinary growth of international trade, and the availability of the wide open ocean to carry their cargo, it is difficult to argue that transport constraints explain the decline in the freight intensity of output in the coastal economy and, by extension, the Chinese economy at large. More likely, the decline in internal tonne-kilometres over GDP reflects the diversion of trading activity away from the internal market to international partners, brought about by the removal of barriers to international trade, aided and abetted, perhaps, by the growth of internal barriers to trade.

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Table IX: Decline of Internal Tonne-Kms to National Income by Region												
	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
National:	1.50	1.48	1.44	1.38	1.40	1.43	1.41	1.34	1.41	1.39	1.38	1.24
Coastal:	2.12	2.07	2.01	1.88	1.92	1.97	1.91	1.80	1.94	1.91	1.88	1.63
Inland:	0.94	0.95	0.94	0.91	0.91	0.92	0.92	0.88	0.90	0.89	0.87	0.81
C. Output Share:	0.47	0.47	0.47	0.48	0.49	0.49	0.49	0.50	0.50	0.49	0.51	0.53

Note: These data refer to railway and waterway transport alone. In a later draft I will adjust the coverage to include highway transport and extend the time series using GDP measures of output.

Figure IX: Merchandise Trade over GDP

Note: Both in units of domestic currency. Source: CSY.
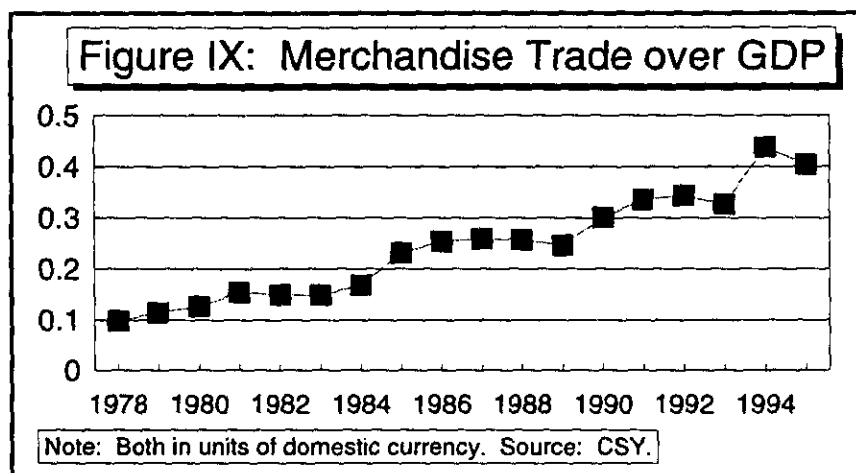
V Conclusion

If one wishes to argue that one of the perils of gradualist reform is the possibility that it will give rise to new distortions, the removal of which poses new challenges to would-be reformers, one must present evidence of the appearance, in the aggregate, of a new distortion whose birth can credibly be ascribed to the endogenous response of actors to the rental opportunities created by gradualist reform and whose lifespan far exceeds that of the rents which originally motivated its arrival. In its focus on the interregional distribution of production in the People's Republic of China, this paper has sought such evidence. Despite widespread, and presumably excess, diversification under the plan, the overwhelmingly dominant trend of the reform period has been toward further diversification, as different regions of the economy duplicated each other's industrial structure in an attempt to capture centrally mandated industrial rents. Although centrally mandated price wedges have now all but disappeared, the process of industrial duplication, having slowed and perhaps even stopped, nevertheless shows little tendency to reverse itself.

This paper also considers alternative explanations and decompositions of the "anomaly" it chronicles. Historically, in the People's Republic, the interregional dispersion of levels of income has been significantly related to the dispersion of patterns of production, but changes in the dispersion of income during the reform period have been far too small to explain anything but a small fraction of the rapid convergence in the structure of production. A simple variance decomposition indicates that, in aggregate data, convergence in the structure of production has not been driven by a reduction in the variance of relative sectoral labour productivities or the variance of relative labour allocations, but rather by a rapid deterioration in the covariance between these two endogenous variables. Using an analytical framework derived from standard trade theory, I argue that these results are incompatible with convergence in patterns of comparative advantage and are, instead, indicative of growing interregional barriers to trade. Finally,

data on internal freight movements indicate that these have declined relative to GDP, which

provides circumstantial evidence in favour of the notion of rising interregional transport costs. A

decomposition of transport movements into the coastal and interior regions of the economy,

however, shows that declines in internal freight movements have been greatest in the coastal

provinces, which have access to coastal shipping. In conjunction with the evidence on the

covariance of labour allocations and relative productivities, these data paint a picture of an econ-

omy which, while becoming more and more open internationally, has become more and more

fragmented internally.

Fundamentally, the central theme of this paper is 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, out-

puts and enterprise budgets, these functions have been taken up, albeit in a less systematic fash-

ion, 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.[32] Consequently, whatever the welfare costs of the new distor-

tions, it is not surprising that on *net* the devolution of power has greatly increased welfare, as

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[32] Surprisingly, it is actually possible to argue that overall improvements in efficiency dur-
ing the reform period have not been that high. My TFP estimates (available upon request) indi-
cate that productivity growth in the non-agricultural economy during the 1978-1994 period
averaged 1.1% per annum, only slightly better than the 0.7% per annum attained during the
Cultural Revolution. Rising participation rates, improved educational levels and the transfer of
labour out of agriculture explain most of the pre and post reform growth in the non-agricultural
sector. The moderate reform period TFP growth would suggest that, while expediting a move-
ment of (possibly slack) resources out of agriculture and continuing to encourage valuable
investment in physical and human capital, the reforms, and local government control, have not
been that successful in raising the efficiency with which resources are used in the non-
agricultural sector. This conclusion, however, requires that the reader accept an adjustment I
make (using other Chinese price statistics) to the Chinese output deflators. If one accepts the
officially reported deflators, then the post reform TFP growth is truly spectacular, i.e. on the
order of 3.7% per annum.

witnessed by the extraordinary growth of the past two decades. 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 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.

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