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Subsidising inequality: Economic reforms, fiscal transfers and convergence across Chinese provinces

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Across Chinese Provinces

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I. INTRODUCTION*

In a vast country such as China, the regional impact of economic reforms naturally commands high policy interest. As regions may differ according to initial conditions such as economic structure, resource endowments, and level of development, the outcome of China's transformation process towards the market is expected to be regionally differentiated. Moreover, one element of the reform process in China has been the reduction of inter-provincial fiscal transfers from the coastal area to the interior. Indeed, in recent years, there has been a growing concern that a widening income gap between the prosperous coast and the laggard interior might eventually cause the break up of the Chinese national state. Such concerns (typically associated with a call for more inter-provincial redistribution) run counter to the theoretical expectation that regional income convergence should accelerate in a country implementing economic reforms as factor markets improve and capital starts flowing from richer to poorer areas.

This paper presents results that overall confirm the theoretical expectation that reforms have led to the convergence of per capita incomes across Chinese provinces. However, this process has been uneven both across time and across

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regions of China. The paper shows that convergence was more rapid during the early reform phase than after the mid 1980s. This recent slow-down in convergence is due to a combination of two factors; a widening average income gap between the coast and the interior and the partial reversal of convergence among interior provinces after 1985. While faster growth along the Chinese coast can be explained as a result of favourable structural conditions and rising investment rates, the lack of income convergence among interior provinces after 1985 may be attributed to the perverse effects of inter-provincial transfers, causing capital to flow to rich rather than poor provinces. Hence, further fiscal decentralisation is unlikely to harm the poorest interior provinces. Rather than calling for additional transfers they should aim at copying the strategy of poorer coastal provinces in the 1980s to attract domestic and foreign private capital with a vigorous implementation of reform measures.

The results of this paper are related to a growing body of empirical literature on provincial economic development in China during the reform period. Hsueh, Rawski and Tsui (1994) and Wu (1995) look at efficiency improvements in state industry, and state industry, rural industry and agriculture respectively. The first source finds a convergence of efficiency levels in state industry across provinces, indicating that technologically backward provinces have moved closer to the production frontier with economic reforms. The results in Wu (1995) are more ambiguous, revealing that the convergence of efficiency levels in state industry

has been confined to the coastal area. In rural industry (which is largely free of state interference) efficiency levels have tended to converge throughout China, while in agriculture they have diverged. The average weighted increase in Total Factor Productivity (TFP) has been higher along the coast than in the interior, a result that will be supported below. Jian, Sachs and Warner (1996) and Gundlach (1996a) study the convergence of Gross Domestic Product (GDP) per worker across Chinese provinces over the 1952-1993 and 1978-1989 periods respectively. Both find a convergence rate of around 2 per cent per annum for the whole reform period. Jian, Sachs and Warner also show that there was no convergence before the start of reforms in 1978 and that the trend towards income convergence during the reform period had stopped by the early 1990s. These results are in accordance with the present study, although the interpretation differs from the one given in this paper, as discussed below.

The paper is structured as follows. Section II presents the evidence on regional income convergence in China since 1978. It identifies a slow-down in the rate of convergence for the 1985-1992 period and discusses two theoretical possibilities that could account for this finding. A regionally differentiated analysis is suggested in order to verify the empirical plausibility of the two theoretical possibilities. Section III explains the better post 1985 growth performance along the coastal provinces of China in terms of an increase in investment and higher TFP growth. It then estimates convergence rates conditional on investment rates

and structural conditions that might be related to higher TFP growth and finds evidence for conditional convergence after 1985. Section IV turns to fiscal transfers and their impact on capital flows and investment rates across Chinese provinces to account for the lack of income convergence among interior provinces. Section V concludes and draws some policy implications.

II. CONVERGENCE IN CHINA SINCE 1978

There are two ways to measure the convergence of per capita incomes. The first measure computes the coefficient of variation of per capita or per worker incomes. Thereby, GDP is typically taken as a measure of income, abstracting from transfers from abroad. If the coefficient of variation of per capita or per worker incomes falls over time in a given cross-section of provinces or countries, *sigma convergence* is said to obtain (Sala-i-Martin, 1995). The second measure of convergence is obtained by regressing the growth rate of per worker incomes against its initial level as defined by equation (1). This yields an estimate of *beta convergence.*

(1) $\ln Y_t - \ln Y_0 = A - \left(1 - e^{-\beta t}\right)\ln Y_0$

Y_t - income per worker at time t

Y_0 - initial income per worker

A - regression constant equal to $\left(1 - e^{-\beta t}\right)\ln Y^*$ with Y^* = steady state income

β - convergence rate per annum

t - time index.

Equation (1) is derived from a standard neo-classical growth model. In steady state, growth is entirely exogenous and driven only by technological change, while the level of per worker income is determined by the level of technology, and the rates of savings in physical and human capital. Linearly approximating the level of real income per worker around its steady state leads to the relationship in (1) (Mankiw, Romer and Weil, 1992).[1]

The two measures are related to each other in that the existence of beta convergence is a necessary condition for sigma convergence. However, it is not a sufficient condition. Because the cross-country evidence for sigma convergence is weak, recent contributions to the neo-classical growth literature have introduced the concept of conditional convergence, whereby the estimate of beta in (1) is conditioned by variables that control for differences in steady state incomes. Conditional beta convergence may obtain even in the absence of sigma convergence (Sala-i-Martin, 1995). In other words, while sigma convergence measures the absolute dispersion of incomes, beta convergence conveys information on the catch-up potential of poor economies.

To compute these two measures, I draw on two data sources. First, Hsueh, Li, and Liu (1993) have provided a comprehensive set of provincial statistics drawn

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1 Equation (1) is defined in income per worker terms because of its relationship to the underlying production function. The labour force is counted as an input rather than the population.

from the provincial statistical yearbooks and covering the period 1949-1989. The advantage of this data set (Data 1) is that it was computed with an aim to provide consistent and comparable data across provinces. The disadvantage is that the time period starting with the reforms in 1978 is thereby shortened to only eleven years and more recent developments are not captured. Moreover, as Jian, Sachs and Warner (1996) point out, this source becomes increasingly unreliable towards the end of the 1980s. Thus, I construct a second data set (Data 2) from Herrmann-Pillath (1995) which comprises basic national income and production statistics, retail prices, labour force and population data for 1978-1992 drawn from the China Statistical Yearbook (SSB, var. issues). As Gross Domestic Product (GDP) and labour force data in this source are only available from 1987 and 1985 respectively onwards, I splice the two series recomputing the data from Hsueh, Li, and Liu (1993) using the implicit growth rate and going backwards from the 1987 and 1985 figures in Herrmann-Pillath (1995). Both data sets contain 29 provinces. There are two missing observations (Qinghai and Guangxi), however, for the years 1979 and 1981-1985. Table 1 presents coefficients of variation for real GDP per capita and per worker for 1978-1992. As can be seen, the differences between Data 1 and Data 2 are small. There is a continuous decline in the coefficient of variation of GDP per capita from 1978 through 1992 and of GDP per worker from 1978 through 1990 after which no further decline in this series can be observed (see also Jian, Sachs and Warner, 1996). Hence,

Chinese provinces have converged in the sense of sigma. For the real GDP per worker series, however, the decline in dispersion is larger during the early part of the 1980s, a result that relates to the estimates of beta convergence for different time periods below. Note that GDP per worker dispersion is lower than GDP per capita dispersion as labour force participation rates are positively related to the level of development. The fact that this difference has narrowed since 1978 might indicate growing labour mobility across provinces (Herrmann-Pillath, 1995). Finally, in column 3 of Table 1, I also report coefficients of variation of GDP per worker for Data 2 where all missing values for the provinces Qinghai and Guangxi have been filled up using a constant growth rate between the last and next years available. The results are similar and I henceforth use the data without missing values for reasons of comparability across years.[2]

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2 Note that the computations in Table 1 treat each province as a unit of observation with a similar weight. If one were to compare the standard of living of individual Chinese across the whole country, a population weighted measure such as the GINI coefficient would be more appropriate. I have also computed GINI coefficients for the same data set. They tend to greatly accentuate the decline in income convergence by the mid-1980s. Indeed, the GINI coefficients increase after 1985 to regain almost their 1978 level by 1992. For similar results, see Song (1995). This evidence might explain the large interest in issues of spatial and personal income distribution in the Chinese reform debate (see Griffin and Renwei, eds., 1993).

Table 1 – Variation Coefficients of Gross Domestic Product per Worker and Gross Domestic Product per Capita

Data set / Year	GDP per worker 1	GDP per worker 2	GDP per worker 2 (no missing values)	GDP per capita 1	GDP per capita 2
1978	0.71	0.71	0.71	0.98	0.98
1979	0.66	0.66	0.66	0.92	0.93
1980	0.66	0.66	0.67	0.91	0.91
1981	0.63	0.63	0.63	0.88	0.88
1982	0.60	0.60	0.61	0.84	0.84
1983	0.60	0.59	0.60	0.81	0.81
1984	0.59	0.58	0.60	0.78	0.78
1985	0.58	0.58	0.56	0.75	0.72
1986	0.57	0.57	0.54	0.72	0.69
1987	0.55	0.57	0.54	0.68	0.66
1988	0.55	0.56	0.53	0.67	0.63
1989	0.55	0.55	0.52	0.65	0.61
1990	–	0.53	0.50	–	0.57
1991	–	0.53	0.50	–	0.57
1992	–	0.54	0.51	–	0.56

Source: Own calculations; Hsueh, Li and Liu (1993); Herrmann-Pillath (ed.) (1995).

While Table 1 overall offers an optimistic assessment of cross-provincial income dynamics since the start of reforms it allows no firm conclusions on changes in the rate of convergence over time which have received much attention in the recent literature. Table 2 presents estimates of the convergence coefficient beta obtained from Non-Linear-Least-Squares estimation of equation (1) for various time periods. The point estimates for the 1978-89 and 1978-92 periods (Data 1 and Data 2) are 2.24 per cent and 2.55 per cent respectively. The results for Data 1 repeat Gundlach's (1996a) results based on the same data set. The point

estimates of beta are in line with studies of income convergence across regions of the United States, Japan, the United Kingdom, West Germany, France, and Spain (Sala-i-Martin, 1995) which produce estimates of beta around 2 per cent per annum. There are notable variations in the point estimates between periods, with the late 1970s and early 1980s displaying a higher rate of convergence than the late 1980s and early 1990s. Constructing a 95 per cent confidence interval around the point estimate for the first subperiods (1978-1983 and 1978-1985 respectively) reveals a significant difference in the point estimate for the 1985-1992 subperiod, but not for the 1984-1989 subperiod. In line with the results for sigma convergence in Table 1, beta convergence across Chinese provinces slowed after the mid-1980s. The remainder of the paper focuses on explaining the slow down of convergence in the 1985-1992 subperiod. All further calculations are thus based on Data 2.

Table 2 – Estimates of Beta Convergence Coefficients, various periods[a]
– Estimated Reversion: $\ln YI_t - \ln YI_0 = constant - \left(1 - e^{-\beta t}\right) \ln Y_0$

Data Set	1			2		
Time period	1978-89	1978-83	1984-89	1978-92	1978-85	1985-92
Beta	0.0224***	0.0307***	0.0175*	0.0255***	0.0344***	0.0082
S.E.	(0.0074)	(0.0103)	(0.0097)	(0.0093)	(0.0103)	(0.0101)
$\bar{R}^2$	0.305	0.294	0.124	0.287	0.347	0.025

[a]Significance levels: *** = 1 per cent, ** = 5 per cent, * = 10 per cent.

Source: Hsueh, Li and Liu (1993); Hermann-Pillath ed. (1995); own calculations.

The theory of growth from which equation (1) is derived provides two possibilities to account for a change in beta convergence rates over time. The first possibility is that some relatively richer provinces have experienced a shift in their steady state incomes, either because of a permanent increase in investment or as a result of institutional or technological change (see Islam, 1995). Restricting all provinces to the same steady state as in equation (1) could therefore produce a biased estimate of beta. To identify the „true" rate of convergence equation (1) would have to be appropriately conditioned. The other possibility why beta convergence might fall is that capital mobility across China as a whole has declined. As Barro, Mankiw and Sala-i-Martin (1995) show the estimate of beta is directly related to the parameters of the production function by the following two formulae representing the case of physical capital mobility and no physical capital mobility respectively.[3]

$$(2a) \quad \beta = (n+d+g)\left(1-\frac{\alpha_2}{1-\alpha_1}\right)$$

3 The two formulae are derived from a three input production function with mobile or immobile physical capital, immobile human capital and raw labour. Such a model is more consistent with the evidence of relatively slow income convergence in the face of substantial physical capital mobility than the traditional Solow model with only physical capital as accumulated input (Gundlach, 1996b).

(2b) $\beta = (n+d+g)(1-\alpha_1-\alpha_2)$

α_1 = production elasticity of physical capital

α_2 = production elasticity of human capital

n = rate of population growth

d = rate of depreciation

g = rate of technical progress.

The difference in the convergence rates for open and closed economies is the larger the higher the share of physical capital in production. Specifically, the ratio of beta(closed) to beta(open) is 1-alpha1 (see also Gundlach, 1996b).[4] At a more general level, the second argument relates a change in the convergence rate over time to changes in the allocation of capital among provinces.

Both possibilities have some support in the literature. However, the underlying theoretical reasoning is rarely made explicit. Jian, Sachs and Warner (1996) suggest that the slow down in convergence is due to a growing income gap between the coast and the interior. The two major advantages the coast has, according to these authors, is the access to international capital markets, and the

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4 In the present case of a decline in beta from 0.034 to 0.008, the implied value of alpha1 would be 0.77. This is in line with the high average share of physical capital in national income in developing countries as shown by Gundlach (1996b) but contradicts the same author's production function estimates for China (Gundlach 1996a). The present paper is unable to resolve this issue. I will show below that an overall decline in capital mobility may safely be excluded as a reason for the slow-down in convergence. Thus what value alpha1 actually has is inconsequential in this context. Section IV moreover shows that the qualitative results of the paper are robust to the choice of factor shares.

existence of a pool of cheap agricultural labour located close to the main export centres. While the first factor would suggest that the convergence rate among coastal provinces is faster because they are open economies, the second factor could imply that the coast may have increased investment in response to the profit opportunities provided by cheap labour and export demand and thus has experienced a shift in the steady state. However, once the authors control for the two factors, the evidence for convergence surprisingly disappears altogether. This makes an interpretation of their results difficult in the light of the foregoing theoretical analysis. A number of other studies have dealt with capital mobility across Chinese provinces (Ma, 1994; World Bank, 1994; Herrmann-Pillath, 1995). All of these studies argue that capital mobility in China as a whole has declined over the course of reform. One suggestion made in this context is that the reduction of inter-provincial fiscal transfers might have greatly contributed to this decline and hence fiscal decentralisation could be one reason for the lack of income convergence in the second half of the 1980s.

The latter argument is built on a dubious assumption, however. Thus, if capital mobility declined after the mid-1980s as a result of fiscal decentralisation, this implies that the system of inter-provincial fiscal transfers before that was beneficial to income convergence. This would single out China as the only socialist economy that effectively emulated the market, at least in the area of inter-regional capital flows. Reassuringly, the system of fiscal transfers was in

place long before 1978 and for the entire 1952-1978 period there is hardly any evidence for per capita income convergence (Cannon, 1990; Jian, Sachs and Warner, 1996). While this evidence would argue against an overall decline in capital mobility in China as a cause of the convergence slow-down, it does not exclude the possibility that changes in capital allocation within regions of China may have slowed the convergence process.

The above discussion suggests that in order to verify the plausibility of the two theoretical propositions, a regionally differentiated analysis is in order. Thereby, I start from the observation in Jian, Sachs and Warner (1996) that cross-provincial income dynamics are characterised by a growing income gap between the coastal and interior regions of China.

Graph 1 displays the log of GDP per worker over the 1978-1992 period for all provinces, the coast, the coast without the three centrally administered municipalities („cities" which were the richest provinces over the whole reform period), the three cities only, and the interior. The growing gap in GDP per worker between the coastal provinces and the interior is clearly borne out. Another fact emerging from Graph 1 is the rapid convergence of non-city coastal provinces to the level of income in the three cities. This trend is not interrupted by the mid 1980s, so that once one controls for the possibility of a shift in the coastal steady state, convergence within the coast would seem to continue at the same rate.

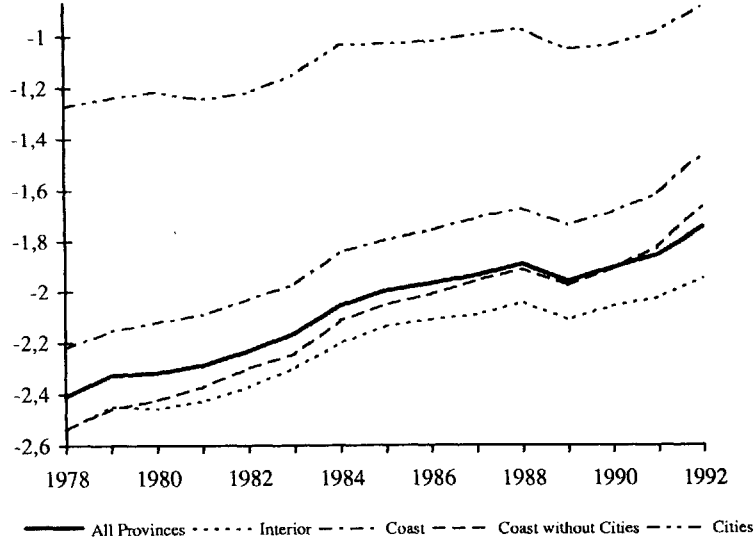
Table 3 – Variation Coefficients of Gross Domestic Product per Worker by Regions

Year	78	79	80	81	82	93	84
Interior	0.38	0.36	0.36	0.34	0.33	0.33	0.31
Coast (without cities)	0.78 (0.44)	0.74 (0.40)	0.73 (0.35)	0.69 (0.33)	0.66 (0.29)	0.66 (0.31)	0.64 (0.31)

Year	85	86	87	88	89	90	91	92
Interior	0.27	0.27	0.28	0.31	0.32	0.32	0.34	0.35
Coast (without cities)	0.61 (0.29)	0.58 (0.30)	0.56 (0.30)	0.55 (0.31)	0.53 (0.30)	0.51 (0.28)	0.48 (0.28)	0.46 (0.27

Source: Hsueh, Li and Liu (1993); Hermann-Pillath ed. (1995).

Graph 1 – Log of Per Capita Income, Various Regions of China, 1978-1992



Source: Data 2.

Graph 1 does not allow conclusions on convergence among interior provinces. This is provided in Table 3 which displays coefficients of variation for GDP per worker in three subsamples. The striking result is that the coefficient of variation in the interior declines only up to 1985 and thereafter increases almost up to its 1978 value. Apparently, the convergence slow-down has been the result of a combination of growing income disparities between regions and a partial reversal of convergence within the interior region.

Table 4 incorporates these observations into estimates of beta convergence rates for the two time periods 1978-1985 and 1985-1992. In the left column of each panel, I show estimates of beta convergence conditional on allowing for a higher average growth rate in the coastal provinces, due for instance to a shift in their steady state income level. In the right column, I further allow the coastal provinces to converge to their steady state at a different rate than the interior provinces. The results may be summarised as follows. First, the coastal provinces have grown significantly faster than the interior. Second, conditioning for this faster growth, there is conditional convergence in the 1985-1992 period, but the average convergence rate is still lower than in the 1978-1985 period. Third, the coast converges at a roughly constant rate (around 3-4 per cent). The decline in the average convergence rate once differences in steady states are taken into account is almost entirely due to a partial reversal of convergence within the

interior in the 1985-1992 period (note the negative implied beta in the last column of Table 4).

Table 4 – Estimates of Beta Convergence Coefficients Including Level and Slope Dummies for Coastal Provinces – Dependent Variable: $\ln Yl_t - \ln Yl_0$ [a]

Time Period	1978-92		1978-85		1985-92	
Constant	-0.363 (0.217)	-0.419 (0.399)	-0.213 (0.150)	-0.453 (0.270)	-0.090 (0.141)	0.259 (0.253)
Coast (level dummy)	0.267*** (0.085)	0.343 (0.462)	(0.101)* (0.059)	0.429 (0.313)	0.168*** (0.055)	-0.293 (0.288)
$\ln Yl_0$	-0.382*** (0.083)	-0.404*** (0.156)	-0.245*** (0.057)	-0.340*** (0.105)	-0.135** (0.064)	0.029 (0.118)
$\ln Yl_0$ * Coast (slope dummy)	–	0.031 (0.185)	–	0.134 (0.126)	–	-0.227* (0.139)
Implied β	0.0344*** (0.0096)	0.0369* (0.0186)	0.0402*** (0.0109)	0.0593** (0.0228)	0.0207* (0.0106)	-0.0041 (0.0164)
Implied β Coast	–	0.0345*** (0.0105)	–	0.0413*** (0.0128)	–	0.0326** (0.0146)
$\bar{R}^2$	0.482	0.484	0.414	0.440	0.283	0.352

[a] standard errors in parentheses; * = 10 per cent, ** = 5 per cent, *** = 1 per cent significance level.

Source: Own calculations from Data Set 2.

In the remainder of the paper, I argue that favourable structural characteristics, a rise in investment and the change in reform emphasis from agriculture to industry have increased the steady state income along the coast while an increasingly perverse system of inter-provincial fiscal transfers rather than a decline in capital mobility has led to the break down of convergence in the interior.

III. INDUSTRIAL REFORMS, STRUCTURAL CHARACTERISTICS AND CONDITIONAL CONVERGENCE

This section tries to explain why the coast has grown faster than the interior since the mid-1980s. My story is similar to the accounts in Yussuf (1994) and Jian, Sachs and Warner (1996) in that it stresses rural industrialisation and access to export markets. In contrast to the latter source, however, I do find conditional convergence once I control for a possible shift in the coastal steady state. Thereby, the main factor behind the growing income gap to the interior is higher TFP growth in coastal provinces (see also Perkins et al., 1993; Raiser, 1995; Wu, 1995).

Economic reforms in China started in agriculture. The shift from the commune system to the household responsibility system led to a dramatic increase in agricultural productivity with growth of output in agriculture outstripping industrial output growth from 1978 to 1983. As the share of agriculture in GDP across Chinese provinces in 1978 was highly negatively correlated with initial per capita income, it is no wonder that the early reform period has exhibited rapid convergence.[5] In the second half of the 1980s, reform efforts shifted to industry.

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5 This fact also helps to explain why Jian, Sachs and Warner (1996) do not find any convergence once they control for the share of agriculture in their growth regressions on initial income. In order to explain the slow-down in convergence it is more useful to control for variables that are at least not negatively related to initial income and whose positive impact on growth might thus overshadow the underyling trend towards convergence.

In particular price liberalisation, the accelerated entry of non-state firms (NSFs), and a number of profit oriented incentive schemes in state industry have led to rapid industrial output and substantial TFP growth. As I will show, this has allowed the coast to grow more rapidly than the interior. By contrast, agriculture was no longer a growth motor on its own. The productivity gains of the early 1980s were soon exhausted and the initial improvement in agriculture's terms of trade was partially reversed due to remaining price controls on food. Because the beneficial impact of industrial reforms was largest in the coastal provinces, and the latter were relatively rich by the mid 1980s (Graph 1), the „side effect" of industrial reforms was to weaken the evidence for convergence.

The change in reform emphasis to industry has benefited the coast for two reasons. First, the coast has traditionally hosted most of China's light industry. This branch has experienced an improvement in its terms of trade during the two-track price liberalisation and has been far more exposed to foreign competition than the traditional heavy industry concentrated in the Northern regions of China or mineral extraction in the West of the country. This has encouraged investment and has led to an above average rate of TFP growth in light industry.[6] Second, the coast has started industrial reforms in 1985 with a relatively well developed non-state sector. Particularly in rural areas, this has helped the mobilisation of savings and created domestic competition for state-owned enterprises (SOEs).

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6 For micro-economic evidence see Hay et al. (1994) and Perkins (1996).

Again, one would expect an increase in investment and possibly higher TFP growth as a result. Note that there is nothing irreversible about the structural advantages of the coast. However, as I will show in Section IV, the current pattern of capital allocation in the interior so far has prevented poorer interior provinces to attract capital for a similar pattern of rural, non-state sector based industrialisation process.

Table 5 presents average scores for the share of agriculture in GDP, the share of non-state firms (NSFs) and of light industry in industrial production in the year 1985, and investment rates in physical and human capital for the 1978-1985 and 1985-1992 period. The number of books published per capita, a variable proxying for the stock of human capital (average for 1985-1989) is also provided (see Gundlach, 1996a for a discussion of the appropriateness of this variable). The table provides support to the contention that the coast has enjoyed structural characteristics that allowed it to benefit disportionately from industrial reforms. The average share of light industry and of NSFs in industrial production is significantly higher along the coast. Moreover, the coast has experienced a significant increase in investment rates between the 1978-1985 and 1985-1992 periods, as expected. Note, however, that investment rates both in physical and human capital have not differed significantly between the coast and the interior in both time periods. While the increase in investment should have accelerated

Table 5 – Provincial Characteristics, Regional Averages, Selected Years or Periods[a]

	Share of agriculture in GDP (1985)		Share of non state firms in industrial production (1985)		Share of light industry in industrial production (1985)
Coast	0.266* (0.042)		0.399* (0.042)		0.481* (0.024)
Coast without cities	0.334 (0.031)		0.449* (0.032)		0.480* (0.032)
Interior	0.351 (0.019)		0.256 (0.016)		0.389 (0.017)
	Investment/GDP		Secondary school/ Enrolment ratio (*SCHOOL*)		No. of books published per head
	78/85	85/92	78/85	85/92	85/89
Coast	0.241 (0.013)	0.315 (0.013)	0.054 (0.004)	0.049 (0.002)	0.005* (0.002)
Coast without cities	0.232 (0.010)	0.304 (0.015)	0.052 (0.004)	0.047 (0.002)	0.002 (0.0003)
Interior	0.262 (0.020)	0.292 (0.016)	0.053 (0.005)	0.050 (0.005)	0.002 (0.0002)

[a]A star indicates a significant difference in the sample mean compared to the interior.

Source: Hsueh, Li and Liu (1993); SSB, var. issues.

growth along the coast, it is insufficient as a cause for the growing average income gap to the interior. Finally, the share of agriculture has differed between the two regions, but only on account of the three cities. This relates well to the contention that agriculture on its own was relatively unimportant for growth after 1985. It receives no further consideration in the present analysis.

I now investigate the impact of the identified regional differences on per capita income convergence. For this purpose, I estimate convergence regressions

Table 6 – Cross-Provincial Growth Conditional on Investment Rates and Structural Characteristics, Implied Convergence Rate[a] – Dependent Variable: $\ln Yl_t - \ln Yl_0$

Constant	-0.996*** (0.345)
$\ln I / \text{GDP} - \ln(n+d+g)$[b]	0.357** (0.157)
$\ln(SCHOOL) - \ln(n+d+g)$	0.010 (0.040)
Non state firms / industrial production	0.078 (0.219)
Light industry / industrial production	0.893*** (0.302)
$\ln Yl_0$	-0.224** (0.087)
Implied β	0.036** (0.016)
$\bar{R}^2$	0.459

[a]Standard errors in brackets, * = 10 per cent, ** = 5 per cent, *** = 1 per cent significance. — [b]n = rate of population growth in each procince, $d+g$ = 0.07 per cent by assumption (see Gundlach 1996a).

Source:

conditional on structural characteristics and on investment rates in phyiscal and human capital. I obtain strong evidence for conditional convergence among Chinese provinces (Table 6). The point estimate of beta rises from 0.008 in the unconditional case to 0.036 in the conditioned regression. The latter estimate is statistically the same as the unconditioned estimate for the 1978-1985 period. The structural characteristics have the expected sign. However, only the share of light industry is significant. Because investment rates are controlled for, the additional impact of this variable on growth is largely through TFP growth, as was posited

above. NSFs have no impact on growth through a higher rate of increase in TFP, a result that contradicts a number of studies on enterprise performance including by the present author (Jefferson, Rawski, and Zheng, 1992; Raiser, 1995). Most of these studies do not control for the possibility of selection bias due to a different distribution of NSFs and SOEs across industries which might explain the apparent contradiction to the present results. Finally, because investment rates during the 1985-1992 period do not significantly differ between the coast and the interior, the evidence in Table 6 allows the conclusion that higher average growth along the coast is largely based on higher TFP growth. Yet the significance of investment rates in physical capital suggests that variations in investment rates have had a substantial impact on provincial growth rates.[7] The next section demonstrates that apart from higher TFP growth along the coast, the nature of capital flows among interior provinces and the impact of inter-provincial fiscal transfers on investment are the principle reasons behind the convergence slow-down.

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7 The coefficient on human capital investment is insignificantly different from zero. Accepting this result, the results in Table 6 would imply a value of alpha1 around 0.6. However, there are reasons to believe that the insignificance of the implied alpha2 results from measurement error (Gundlach, 1996a). The conditional convergence results are unaffected if once restricts the model to different values for alpha1 and alpha2 (Section IV).

IV. CAPITAL FLOWS, FISCAL REDISTRIBUTION AND PERSISTENT INCOME GAPS IN THE INTERIOR

In neoclassical growth theory, convergence is predicted because the marginal product of capital declines with capital intensity and capital intensity rises with per capita income. By the same token, capital is expected to flow from rich to poor areas and thereby accelerate the process of convergence. However, political interventions may cause capital flows to go in the opposite direction. Correspondingly, such interventions are likely to reduce convergence.

In China, as in all socialist economies, the fiscal system has traditionally played an overarching role in the allocation of investment. However, since the mid 1970s, China has begun to decentralise its fiscal system and allow provincial governments to retain an increasing share of the revenue from local economic activity. Generally, this system may be said to have increased incentives for revenue collection and efficiency improvements in the local economy and thus to have been an important element of the overall success of Chinese market oriented reforms up to date (Qian and Roland, 1994; Raiser, 1995). While this incentive effect is frequently mentioned, so far little research has been done on the direction of the still existing fiscal transfers. Moreover, while fiscal redistribution has diminished, the central government has repeatedly used the credit plan to fill the gaps. The direction of fiscal transfers may thus tell us something about the direction of directed credit as well, for which there is no comparable data source.

The aim of this section is to show that fiscal redistribution has had a substantial impact on capital flows across Chinese provinces and that the direction of such flows has followed less and less criteria of inter-regional equity. In other words, fiscal redistribution has followed a perverse pattern since the mid 1980s and arguably has cemented rather than reduced income inequalities among interior provinces.

Table 7 is reproduced from Ma (1994) and shows how fiscal transfers have diminished overall during the reform period (more precisely between 1983 and 1991). Fiscal transfers are measured as the difference between locally collected revenues and local government expenditures, a measure also used by Ferdinand (1989) to characterise the process of fiscal decentralisation. The figures from Ma (1994) put this difference in relation to total revenue. I have added two columns giving the ratio of the fiscal balance to GDP and two further columns showing the level of GDP per capita in 1983 and 1991. The dependence of local government expenditures on fiscal transfers in some provinces, most notably Xinjiang, Qinghai, Ningxia and Inner Mongolia has been very substantial indeed. Moreover, with resource shifts of up to 13 per cent of GDP even in 1991, fiscal redistribution was still a powerful tool for regional economic policy. Table 7 also clearly reveals the largely unidirectional nature of fiscal transfers from the rich coastal provinces to some selected interior provinces. The poor

Table 7 – Fiscal Transfers Across Chinese Provinces, 1983 and 1991[a]

Province	Fiscal Balance/ Revenue in per cent		Fiscal Balance/ GDP in per cent		GDP per capita in Yuan	
	1983	1991	1983	1991	1983	1991
Coast						
Fujian	-42	-12	-4.2	-1.5	995.5	1644.1
Guangdong	-4	5	-0.4	0.5	9901	2087.6
Guangxi	-36	-23	-4.5	-3.2	648.7	874.9
Hebei	22	2	2.9	0.2	986.7	1510.2
Jiangsu	57	11	9.6	1.0	1259.1	1771.8
Liaoning	50	6	9.7	0.9	1895,9	2491.3
Shandong	37	1	4.4	0.1	1162.7	1881.8
Zhejiang	47	20	7.9	2.4	1613.4	1597.9
Cities						
Beijing	51	10	11.1	1.5	2899.2	3509.8
Shanghai	88	47	38.3	10.5	4212.4	4513.7
Tianjin	47	18	14.8	3.1	2588.4	3328.6
Interior						
Anhui	9	-57	-8.7	-5.1	832.1	972.5
Gansu	-42	-28	-5.1	-4.4	979.1	1126.8
Guizhou	-88	-22	-8.3	-3.6	611.1	795.3
Heilongjiang	-42	-16	-3.4	-2.1	1993.6	2123.7
Henan	18	-3	2.0	-0.4	894.1	1199.9
Hubei	30	-5	4.6	-0.5	1091.3	1653.4
Hunan	14	-6	1.5	-0.5	830.6	996.4
Inner Mongolia	-227	-69	-16.2	-8.5	1102.3	1591.2
Jiangxi	-28	-28	-2.6	-3.1	856.5	1151.8
Jilin	-37	-27	-3.6	-3.9	1512.9	1559.9
Ningxia	-290	-107	-25.9	-12.9	1082.6	1484.1
Qinghai	-380	-167	-26.9	-12.9	1255.7	1549.3
Shaanxi	-29	-24	-3.5	-3.1	847.3	1195.2
Shanxi	1	-6	0.1	-1.0	1244.7	1482.7
Sichuan	11	-10	1.2	-1.1	698.5	968.1
Xinjiang	-231	-98	-16.7	-8.4	1374.5	2685.0
Yunnan	-40	-11	-5.7	-2.6	675.5	1030.4

[a]Hainan and Tibet excluded.

Source: Ma (1994); Data Set 2; own calculations.

provinces (such as Guangxi and Fujian along the coast and Guizhou, Sichuan and Yunnan in the interior) have all received some subsidies but much less than Xinjiang, Qinghai, Ningxia and Inner Mongolia, all with income levels exceeding

those of the poorest provinces by a ratio close to two. This already indicates that fiscal transfers follow other considerations than regional equity. All of the large subsidy receivers are engaged in some form of mineral or energy production. Xinjiang, moreover has strategic value as China's outpost in Central Asia. Fiscal transfers are thus politically motivated to compensate for remaining price controls and to sponsor regional development in areas of special interest.[8]

What has been the impact of such fiscal redistribution on overall capital flows? Has fiscal decentralisation led to a reduction in capital mobility? To answer these questions, I make use of data on aggregate production and aggregate demand by provinces provided by Herrmann-Pillath (1995) for the 1978-1991 period.[9] Subtracting the former from the latter, I get a value for total net capital flows into a province (positive for capital inflows, negative for outflows). Subtracting this value from the total value of investment one obtains provincial savings as a residual.

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8 Another potential reason for fiscal subsidies from the central government are SOE losses. For instance, Jilin and Heilongjiang provinces have received fiscal transfers throughout the 1980s, inspite of belonging to the traditionally rich Northeastern industrial heartland. In 1993 both had a share of total SOE losses exceeding their contribution to total industrial output by a ratio of two (Broadman, 1995).

9 Gundlach (1996a) uses similar data provided by Hsueh, Li and Liu (1993) stretching only to 1989. Amending this data with observations from the Chinese Statistical Yearbook leads to series for provincial savings and investment which are very close to the data used here. The results are unaffected by the use of the data set.

I first test the hypothesis that capital mobility has declined overall as a result of fiscal decentralisation. For this, I run a regression of the average rate of investment in GDP against the average rate of savings in GDP for the two time periods. Low capital mobility implies a high positive correlation (Feldstein and Horioka, 1980). The coefficients are -0.11 (0.09) and 0.04 (0.11) for 1978-1985 and 1985-1992 respectively (standard errors in parentheses), suggesting that capital mobility across Chinese provinces was high in both periods (see also Gundlach, 1996a). In the next step, I regress the average ratio of net capital flows to GDP against average per capita GDP. In a second regression, I further add the ratio of the fiscal balance to GDP (named SUB) as an explanatory variable.[10] To account for regional differences, I allow for a slope dummy on GDP per capita for the coastal provinces. I also present results for a subsample excluding the three cities, as they stand out as by far the biggest net payers in the system of fiscal redistribution. The results are presented in Table 8. During 1978-1985, net capital inflows are negatively related to per capita GDP, although significantly so only in the coast. In the 1985-1992 period, the correlation turns positive for the interior while remaining significantly negative for the coast, even once the three cities are excluded. Hence, in the interior, there seems to have been a change in the pattern of capital flows between the two periods in the direction of an

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10 The 1983 value is taken as representative for 1978-85 while the 1991 value is used for the 1985-92 period (Table 7).

increasing misallocation of capital from the point of view of income convergence. Once the impact of fiscal transfers is controlled for, the negative correlation between per capita incomes and net capital flows disappears for the coast as well. Capital flows are dominated by the impact of fiscal redistribution. Although capital mobility is apparently high, this reflects political intervention rather than market forces. Moreover, the coefficient on *SUB* increases by a factor of two between the two periods. This suggest that rather than declining, the effect of politically motivated inter-regional redistribution on capital flows across China has been increasing. Because the ratio of SUB to GDP has declined overall, this implies that other forms of capital flows have tended to reinforce the pattern established by fiscal redistribution. One possible candidate are state directed credits through the banking system.

Table 8 – Determinants of Capital Flows Across Chinese Provinces, 1978-85, 1985-92[a] – Dependent Variable: $(Investment - savings)/GDP$

	1978-1985		1985-1992			
					without three cities	
Constant	0.092 (0.059)	0.007 (0.033)	0.051 (0.055)	-0.042 (0.034)	0.059 (0.079)	0.007 (0.044)
GDP p.c.	-0.093 (0.617)	-0.234 (0.323)	0.395 (0.427)	0.196 (0.256)	0.344 (0.582)	-0.172 (0.338)
GDP p.c. Coast	-1.141** (0.459)	0.244 (0.293)	-0.656** (0.289)	0.125 (0.211)	-0.761** (0.309)	0.075 (0.216)
SUB	-	-1.376*** (0.168)	-	-2.573*** (0.366)	-	-2.652*** (0.383)
$\bar{R}^2$	0.512	0.872	0.239	0.765	0.189	0.771

[a]Standard errors in brackets, * = 10 per cent, ** = 5 per cent, *** = 1 per cent significance.

Source: Herrmann-Pillath ed. (1995) for Capital Flows; Ma (1994) for *SUB*.

The central result in Tables 7 and 8 is that fiscal transfers have increased the resources available to relatively richer interior provinces above the level that would be sustained by private capital flows in an undistorted environment. This has allowed such provinces to invest more and this has slowed convergence.

An empirical corroboration of the above argument is given in Table 9. Here, I regress the rate of investment in physical capital to GDP in the 1985-1992 period against a constant, a level dummy for the coast and SUB The results confirm that fiscal transfers have had an important impact on investment rates.

Table 9 – Determinants of Investment Rates 1985-92[a]
– Dependent Variable: *I / GDP*

Constant	0.252*** (0.018)
Coast	0.058** (0.09)
SUB	-0.624** (0.276)
$\overline{R}^2$	0.200

[a]Standard errors in brackets, * = 10 per cent, ** = 5 per cent, *** = 1 per cent significance.

Source: Own calculations.

The coefficient of -0.62 suggests that over 60 per cent of all fiscal transfers have been used to reallocate investment resources from net payers to net receivers of inter-provincial taxes. Moreover, once this effect is accounted for the coast does

have a significantly higher investment rate than the interior. It is only because of the system of interprovincial transfers that the beneficial impact of industrial reforms on econommic performance along the coast has not materialised in higher average investment rates than in the interior (see Table 5). The upshot is that while fiscal redistribution may have prevented the gap between the coast and the interior to widen further, this has not helped convergence, because the money has flown to rich rather than poor interior provinces.

Table 10 – Cross-Provincial Growth Conditional on Investment Rates, Initial Conditions and Fiscal Transfers, Implied Convergence Rate[a]

Dependent Variable:	$\ln Yl_t - \ln Yl_0$	Conditional growth rate
Constant	-1.141	0.315
	(0.337)	(0.223)
$\ln I$ / GDP $- \ln(n + d + g)$	0.489***	-
	(0.167)	
$\ln(SCHOOL) - \ln(n + d + g)$	0.004	-
	(0.038)	
Light industry / industrial production	0.849***	0.687
	(0.264)	(0.354)
SUB^2	-9.418	-3.327
	(5.697)	(6.766)
$\ln Yl_0$	-0.253***	-0.313***
	(0.083)	(0.073)
Implied β	0.042***	0.054***
	(0.015)	(0.015)
$\bar{R}^2$	0.516	0.504

[a]Standard errors in brackets, * = 10 per cent, ** = 5 per cent, *** = 1 per cent significance.

Source: Own calculations.

While the above result of a strong positive impact of fiscal redistribution on investment rates arguably provides the key to understanding the convergence slow-down in China, it is rather surprising in a different context. Thus, it might be argued that the access to subsidies might lower domestic savings efforts, thereby neutralising the positive impact on growth. The high significance of SUB in Table 9 indicates that this is not the case in China. Another possibility is that the dependence on subsidies lowers the efficiency of investment, such as suggested for instance by Kornai's (1980) soft budget constraint theory. By the same token, a province that faces a high rate of central taxation on its tax income may reduce its reform efforts and thus experience a similar decline in efficiency (Raiser, 1995). I thus return once more to conditional growth regressions and test whether the system of fiscal redistribution has a negative effect on growth by lowering TFP, even once its positive contribution to investment in receipient provinces is accounted for. Because the negative incentive effect is argued to effect net payers and receivers in the same direction, the square of *SUB* rather than its original value is used as the variable reflecting the impact of fiscal redistribution. Table 10 presents results for a regression of provincial growth rates against investment rates, the share of light industry, SUB^2 and initial income. Compared with Table 6 above, I exclude NSFs in order to save degrees of freedom, as it had no additional explanatory power. As expected, SUB^2 is significantly negative, albeit only at the 11 per cent level. This gives some support to the contention that a too

heavy dependence on subsidies or an excessive tax burden might lower a province's reform efforts and hence its rate of growth. All other coefficients are not significantly different from their values in Table 6.

Finally, I turn to the issue of measurement error in the human capital investment variable which might have caused it to be insignificant in the growth regressions up to now. To take account of this possibility, I restrict the production elasticties to the values estimated by Gundlach (1996a), assume that the true convergence rate is given by the 1978-1985 average of 0.034, and substract the investment rates in physical and human capital from the growth rate of income to obtain the conditional growth rate as defined by equation (3):

$$(3) \quad growth\ Yl_{conditional} = \ln Yl_t - \ln Yl_0 - a^*\left(\ln(I/GDP) - \ln(n+d+g)\right) - b^*\ln(SCHOOL) - \ln(n+d+g)$$

with

$$a = \frac{\alpha_1}{1-\alpha_1-\alpha_2}*\left(1-e^{-\beta t}\right)$$

$$b = \frac{\alpha_2}{1-\alpha_1-\alpha_2}*\left(1-e^{-\beta t}\right)$$

and $\alpha_1 = 0.25$, $\alpha_2 = 0.60$.

Column 2 of Table 10 reveals that all coefficients remain largely unaltered (they are insignificantly different from the original specification at the 95 per cent level), suggesting that the results of the paper are robust to the exact form of the production function.

V. CONCLUSIONS

This paper has analysed per capita income convergence across 29 Chinese provinces over the 1978-1992 period. It finds that income levels have converged since the beginning of the reform period, in contrast to results for earlier years. However, it also confirms the evidence in other studies that the process of income convergence experienced a significant slow-down in the second half of the 1980s. I suggest two complementary reasons why this was so. First, the average income gap between the relatively prosperous coast and the more backward interior has widened since 1985. This was due to the shift from rural to industrial reforms and the coast's better starting position in this process with a high share of light industry and a correspondingly higher degree of internal and external competition. Second, convergence among interior provinces has been reversed to some extent since 1985. The system of inter-provincial fiscal redistribution still in place after 15 years of substantial fiscal decentralisation is largely to blame for this. Particularly since the mid 1980s, fiscal transfers have tended to flow towards the relatively richer interior provinces to compensate for remaining price distortions and for strategic reasons. As a result, investment rates in relatively richer interior provinces have been pushed up above levels that would be financed by private capital flows. This has not only maintained income gaps in the interior but probably also reduced the efficiency of investment in China overall. Controlling for differences in structural characteristics at the start of industrial reforms and

investment rates, the paper finds strong evidence for conditional convergence for China as a whole.

The clearest policy message emanating from this paper is that fiscal redistribution at least along the present lines should be discontinued in China. To what extent this has been realised by the 1994 fiscal reforms remains to be seen. Since then, the central government has greatly increased the share of revenues under its control. The danger is that it might use such fiscal leeway to prop up ailing SOEs and inefficient public investment projects in the interior. If it cares about inter-provincial equity, it should rather use the money to facilitate an increase in investment in China's poorer rural provinces. For instance, improving market integration through transport investments should provide an important demand stimulus to exports from interior provinces and could attract much needed private capital flows. Improving educational standards particularly in rural areas may also be an important area for government action. Whatever the spending priorities of the central government, the surest way to ensure that regional income inequality is reduced is to improve the mobility of private capital and allow it to seek higher returns in the poorer interior provinces. The current dominance of fiscal transfers in inter-provincial capital flows is certainly not adequate for the further transition to a market economy.

The other policy conclusion that may be drawn from the present analysis is that focusing reform efforts on stimulating light industry, particularly in the non state

sector could generate rapid growth even in land locked interior provinces. According to ongoing research at the International Trade Centre, more and more export oriented businesses in the coastal provinces are moving inland as wages and land prices along the coast have soared.[11] The experience of the coastal provinces during the 1980s suggests that luring such enterprises by lowering taxes, the elimination of red tape in public administration and with a concentration of public activities in infrastructure rather than production promises rich gains in the future. In China's increasingly decentralised economy, the responsibility for economic prosperity lies at least as much at the provincial government level as in Beijing.

11 By personal communication of Dr. Friedrich von Kirchbach at the ITC in Geneva.

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