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The relative contributions of location and preferential policies in China's regional development: being in the right place and having the right incentives☆

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Abstract

A large part of the literature on provincial inequality in China has found it necessary to include regional dummies in the provincial growth regressions. A smaller but vocal part of the literature has emphasised the granting of preferential policies to explain the faster growth of the coastal provinces. We replace the regional dummies with a measure of the ability to participate in international trade (*Geography*), and a preferential policy index (*Policy*). We find that geography and policy had about equal influence on coastal growth (3 percentage points each). Geography affected growth with a much longer lag than policy, however. The policy index was highest for the metropolises (Beijing, Shanghai, and Tianjin) and lowest for the central and northwestern provinces. The preferential policies are to a large extent "deregulation policies" that enabled marketization and internationalization of the coastal economies and allowed them to become more like their East Asian neighbours (and competitors). The weak (statistically insignificant) support for conditional convergence is in line with the existence of

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institutions that retard the income convergence process generated by the movement of labor and capital and by the Stolper–Samuelson mechanism. The household registration system ties the peasants to the land, the monopoly state bank system favors borrowing by state enterprises, and local protectionism reduces inter-provincial trade. Clearly, these institutions need to be deregulated. An effective strategy to develop the western provinces must therefore encompass physical capital formation, human capital formation, and institutional capital formation.

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1. Introduction

Regional disparity has increased quite markedly in the 1990s. Fig. 1 shows the coefficients of variation of per capita provincial incomes constructed from two samples.[1] The first sample consisted of 28 provinces that had complete income data for the 1952–1998 period, and the second sample differs from the first by omitting Beijing, Shanghai, and Tianjin, the three metropolises that have province-level status. The coefficients of variation of GDP per capita (measured in 1995 prices) from these two samples are denoted Cov28 and Cov25, respectively. Cov25 differs from Cov28 by having a smaller dispersion in regional incomes and not showing an upward trend during the 1966–1978 period. These two differences mean that the three metropolises have always been substantially richer than the other provinces, and that the gap between these two groups widened substantially during the period of orthodox socialist economic management. This paper will focus on the common finding in Cov25 and Cov28 that there is a clear upward trend in provincial income inequality from 1992 onward, and that the 1998 level of provincial income disparity is highest since 1952.

This recent rise in regional inequality has elicited significant policy responses from the government. The budgets for infrastructure investments in the poor provinces have increased substantially every year, and a Western Region Development Office has been established under the State Council (the Chinese cabinet) to formulate a comprehensive development strategy and to coordinate its implementation.

The origin and consequences of China's regional disparity growing has been extensively studied in recent years.[2] One prominent view is that preferential policy treatment of the

[1] Unless otherwise indicated, the income data are from the National Bureau of Statistics (NBS 1999). The three main components (primary, secondary, and tertiary sectors) of provincial GDP are recalculated at 1995 prices, and then summed up to obtain the real GDP series of the province, measured in 1995 prices. GDP data for Tibet and Hainan were available only after 1978. Chongqing data were consolidated with those of Sichuan by updating Sichuan data from the State Statistical Bureau (SSB 1997) from 1996 onward with data on Chongqing and Sichuan in subsequent years of the *China Statistical Yearbook*.

[2] To cite but a few recent papers: Tsui (1996), Chan, Hseuh, and Luk (1996), Raiser (1998), Tian (1999), Wu (2000), Démurger (2001), Kanbur and Zhang (2001), and Zhang, Liu, and Yao (2001). Besides the English-written literature, there is also an important Chinese-written literature that is not cited here.

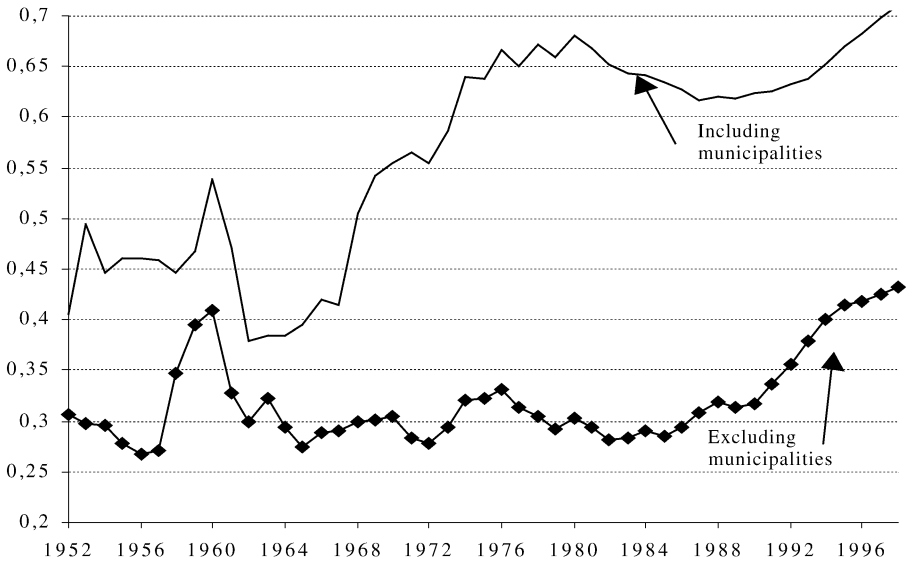

Fig. 1. σ-Convergence across Chinese provinces, 1952–1998.

coastal provinces, especially the establishment of Special Economic Zones (SEZs), was largely to blame for this sustained rise in regional disparity. According to Hu Angang, an advocate for the abolition of SEZs: "If Deng Xiaoping knew the disparities were as big as they are, he would be more militant than I am in trying to eliminate them... In America, the deep differences between the North and the South more than 100 years ago led to the Civil War," and "We must cease subsidizing rich coastal cities. Preferential treatment should be reserved for the poor."[3] Hu Angang's diagnosis is consistent with the common finding in provincial growth regressions that the coastal variable has a positive coefficient that is statistically significant, e.g., Jian, Sachs, and Warner (1996), Chen and Fleisher (1996), Zhang (2001), and Bao, Chang, Sachs, and Woo (forthcoming).

Our thesis here is that the high coastal growth has been due to more than the preferential policies; it came also from advantageous location that enabled export-oriented industrialization; we propose to quantify the relative contributions of geography and preferential policy.[4] The other major innovations in this paper are to construct a preferential policy index, explore

[3] The first quote is from "Deng's Economic Drive Leaves Vast Regions of China Behind," *New York Times*, 27 December 1995, and the second is from the *South China Morning Post* ("Clash over shrinking coffers," 23 September 1995) which also reported that "Mr. Hu slapped the SEZs in the face by accusing them of ripping off the rest of China—and widening the regional gap—by abusing the special policies granted them by the Centre... [and he] concluded that the zones 'should no longer be allowed to remain special.'"

[4] This paper is hence a follow-up to the Bao, Chang, Sachs and Woo (forthcoming) paper. The latter used real GDP data from the individual provincial yearbook, and this paper recalculated provincial GDP as described in footnote 1. The estimations here differ from those in Demurger et al. (2001) by using a sample that included Beijing, Shanghai, and Tianjin. Wang and Hu (1999) discussed how China's heterogeneous geographical conditions can help explain regional economic disparities, but did not include geographical variables in their regressions.

the links between topographical features and income level, show that the geography and policy variables affect income growth with different time lags, and to quantify the impact of geography and policy variables on provincial growth rates in the 1996–1999 period.

2. The regional implications of China's economic policies

Industrialization was shallow in 1949 and largely a coastal phenomenon. Naturally, just like the Soviet Union in 1917, China in 1949 saw its most important economic task to be industrialization, and its industrialization program in the 1952–1978 period was directed by three principles: state ownership, central planning, and regional self-sufficiency. The self-reliance principle was motivated, first, by the perception that it was an effective way of reducing poverty in the inland provinces, and then increasingly by the perception that China faced potential security threats from US-backed forces in East Asia and the growing military presence of the United States in Vietnam. The result was that China in 1964 accelerated its massive construction of military–industrial complexes in western China, popularly referred to as the "Third Front industries." However, from 1972 onward, China began reducing its discrimination against investments in the coastal provinces because the Soviet Union was fast becoming a bigger threat than the United States, an invasion through the traditional land route by the Soviet Union had become much more likely than a coastal landing by armed forces supported by the United States. Coastal enterprises, especially those in Guangdong, were expanded, and export earnings jumped from US$2.6 billion in 1972 to US$3.4 billion in 1973, and then to US$9.8 billion in 1978.

The process of increased economic interaction with the outside world accelerated in 1979 when China embarked upon market-oriented reforms, of which the Open-Door Policy was a key component.[5] The Open-Door Policy consisted of attracting foreign direct investment (FDI) and promoting foreign trade in targeted economic zones. Table 1 summarizes the establishment of these various types of economic zones up to 1994 and reveals that the coastal provinces benefited disproportionately. The leading role of this selective Open-Door Policy in regional growth has been emphasized by a great number of studies (e.g., Berthélemy & Démurger, 2000; Chen & Feng, 2000; Lemoine, 2000; Mody & Wang, 1997; Démurger, 2000). Most of them have found that FDI had an impact on economic growth that went beyond an addition to the capital stock: it also provided competition to domestic firms and hence forced them to raise their productivity, generated demonstration effects that enabled domestic firms to improve their operations, and provided a training ground for future managers of domestic firms in the same industries.

[5] There is a keen controversy about what are the fundamental economic mechanisms in the rapid growth of China after 1978. Some economists (the experimentalist school) believe that the growth was enabled by the discovery of new nonstandard economic mechanisms, e.g., collectively owned rural enterprises and fiscal contracting, while others (the convergence school) see the growth as the result of moving toward a private market economy, whereby best international practices are adopted and modified according to local conditions. See Sachs and Woo (2000) and Woo (2001a) for a review of this debate.

Table 1
Timeline of China's regional preferential policies, 1979–1994

Year of approval	Number and type of opened zone	Location
1979	3 Special Economic Zones	Guangdong
1980	1 Special Economic Zone	Fujian
1984	14 Coastal Open Cities	Liaoning, Hebei, Tianjin, Shandong, Jiangsu, Shanghai, Zhejiang, Fujian, Guangdong, and Guangxi
	10 Economic and Technological Development Zones	Liaoning, Hebei, Tianjin, Shandong, Jiangsu, Zhejiang, and Guangdong
1985	1 Economic and Technological Development Zone	Fujian
	3 Coastal Open Economic Zones	Pearl River delta, Yangtze River delta, and Fujian
1986	2 Economic and Technological Development Zones	Shanghai
1988	Open Coastal Belt	Liaoning, Shandong, Guangxi, and Hebei
	1 Special Economic Zone	Hainan
	1 Economic and Technological Development Zone	Shanghai
1990	Pudong New Area	Shanghai
1992	13 bonded areas in major coastal port cities	Tianjin, Guangdong, Liaoning, Shandong Jiangsu, Zhejiang, Fujian, and Hainan
	10 major cities along the Yangtze River	Jiangsu, Anhui, Jiangxi, Hunan, Hubei, and Sichuan
	13 Border Economic Cooperation Zones	Jilin, Heilongjiang, Inner Mongolia, Xinjiang, Yunnan, and Guangxi
	All capital cities of inland provinces and autonomous regions	
	5 Economic and Technological Development Zones	Fujian, Liaoning, Jiangsu, Shandong, and Zhejiang
1993	12 Economic and Technological Development Zones	Anhui, Guangdong, Heilongjiang, Hubei, Liaoning, Sichuan, Fujian, Jilin, and Zhejiang
1994	2 Economic and Technological Development Zones	Beijing and Xinjiang

Two other post-1978 policy changes—fiscal decentralization and price deregulation—also had significant regional impact. Fiscal decentralization was meant to encourage local initiatives in economic development,[6] and it took the form of individually negotiated tax contracts between the central government and the provinces.[7] Fiscal decentralization lowered state revenue from 35% of GDP in 1978 to 14% in 1992, and hence forced the center to reduce fiscal subsidies to the poorer provinces. Price deregulation in the industrial sector

[6] The evidence on this front is mixed; e.g., Chen (forthcoming) and Zhang and Zou (1998) found negative relationships between fiscal decentralization and economic growth. See the review in Woo (2001a).

[7] For details, see Wong, Heady, and Woo (1995).

initially took the form of a dual track price system for industrial inputs. Since the central and western provinces were the main suppliers of raw industrial materials, the continuation of artificially low prices for these industrial inputs meant that the dual track pricing system was in effect transferring income from the interior producers to the coastal factories. The elimination of the dual track price system in the 1990–1991 period was an equitable move from the viewpoint of regional disparity.

3. Topography and income

Our knowledge of changes in China's economic structure and policy regime in the 1952–1998 period suggests two major channels through which geography has influenced provincial income levels: (a) agriculture and (b) international trade and FDI. China was a predominantly agricultural economy until the middle of the 1980s. For example, taking a province from each of the regions, the agricultural share of employment in 1978 and in 1998 were, respectively, 53% and 49% for Heilongjiang, 74% and 41% for Guangdong, 82% and 59% for Anhui, 77% and 60% for Gansu, and 83% and 70% for Guizhou. Given the large size of the agricultural sector in many provinces during 1978–1998, agricultural productivity was an important determinant of provincial income per capita. Since differences in provincial topographical features, such as elevation and flatness of arable land, help shape differences in agricultural productivity across provinces, they should also help to explain differences in provincial income.

Geography also affects provincial income through physical location. The low cost of water transportation makes the coastal provinces and areas along navigable rivers that flow to the sea better suited to be platforms for producing manufactured exports. When allowed by the government, domestic firms located in these regions would naturally expand production to service foreign markets, and foreign firms would relocate their production there, given the low cost of Chinese labor. Hence, provinces with easy access to sea transportation received boosts to their incomes from international trade whenever China did not cut itself off from the international economy.

Table 2 summarizes some key geographical and economic characteristics of China in the following six regional groupings:

1. *The province-level metropolises* of Beijing, Tianjin, and Shanghai are highly industrialized, and over 71% of their population lives within 100 km of the coast or navigable waters.[8]
2. *The northeastern provinces* of Heilongjiang, Jilin, and Liaoning constituted the industrial heartland of China in 1978 and were the rich provinces of the central plan period.
3. *The coastal provinces* of Hebei, Shandong, Jiangsu, Zhejiang, Fujian, Guangdong, and Hainan have 82% of their population living within 100 km of the sea or navigable rivers and had the highest GDP per capita growth rate in the 1979–1998 period.

[8] Chongqing was granted province-level status in 1997, but we have included its data under Sichuan province.

Table 2
Geographical characteristics by regions

Region	GDP per capita growth rate, 1979–1998 (%)	GDP per capita level in 1978 (yuan/person)	Population density (person/km^2)	Distance from the coast (km)	Pop100km (% of population)	Pop100cr (% of population)	Slope>10 (% of area)	Average slope (%)	Average elevation (meters)	Temperature (degrees)	Rainfall (mm)	Arable land (%)
Metropolises	8.5	3,645	1,104	77	65	71	1.4	1.2	135	10.9	63	36
Northeast	7.9	1,700	138	380	17	18	2.2	1.6	314	4.5	50	21
Coast	10.7	1,154	333	86	60	82	2.6	2.4	267	16.4	103	29
Central	8.4	941	264	492	0	57	2.7	2.4	428	14.9	90	24
Northwest	7.7	1,045	46	1,383	0	0	5	2.8	1,971	6.8	26	8
Southwest	7.8	814	126	656	4	4	14.1	5.2	1,428	16	98	10
Total	9.0	1,355	290	547	24	41	4.3	2.7	804	12.2	74	21

GDP per capita compound annual growth rate throughout 1979–1998 and GDP per capita levels in 1978 are calculated at 1995 constant prices.

Pop100cr = proportion of the population distribution of a province in 1994 within 100 km of the coastline or ocean-navigable river, excluding coastline above the winter extent of sea ice and the rivers that flow to this coastline. Pop100km = proportion of the population distribution of a province in 1994 within 100 km of the coastline, excluding coastline above the winter extent of sea ice. Slope>10 measures the percentage of area within a province with a slope greater than 10%.

Temperature and rainfall are averages throughout the 1951–1988 period. Arable land is available for 1994.

Metropolises = Beijing, Tianjin, and Shanghai. Northeast = Liaoning, Jilin, and Heilongjiang. Coast = Hebei, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong, and Hainan. Central = Shanxi, Anhui, Jiangxi, Henan, Hubei, and Hunan. Northwest = Inner Mongolia, Shaanxi, Gansu, Qinghai, Ningxia, and Xinjiang (Tibet is excluded due to missing data). Southwest = Sichuan, Guizhou, Yunnan, and Guangxi.

Sources: NBS (1999) for economic and population variables; GIS calculations made by Bao Shuming for geographical data, except arable land; Wang and Hu (1999, Table 4.1, p. 83) for arable land.

4. *The central provinces* of Shanxi, Henan, Anhui, Hubei, Hunan, and Jiangxi comprise the agricultural heartland of China and had about the same income level as the coastal provinces in 1978. The two large rivers and their many tributaries endow 57% of the population with easy water transportation.
5. *The northwestern provinces* of Inner Mongolia, Shaanxi, Ningxia, Gansu, Qinghai, Xinjiang, and Tibet are arid, with only 8% of the land being arable, which explains why they have the lowest population density in China.
6. *The southwestern provinces* of Sichuan, Yunnan, Guizhou, and Guangxi have rainfall and temperature conditions that are ideal for crop cultivation, but suffer from being too mountainous, 14% of the land has a slope greater than 10°.

We use three benchmark years—1952, 1978, and 1998—for our econometric exploration of the role of geography in provincial income determination. The 1952 distribution of provincial GDP per capita was a market outcome, the 1978 distribution reflected the biases of central planning, and the 1998 distribution was the joint result of the post-1978 marketization and internationalization of the economy. There are two types of explanatory variables:

1. The ability to participate in sea-based international trade
   - Distance from the coast [Distf = 1/(1 + distance in kilometers)]
   - The proportion of the population distribution of a province in 1994 within 100 km of the coastline or ocean-navigable river, excluding the coastline above the winter extent of sea ice and the rivers that flow to this coastline [Pop100cr][9]

2. Topography
   - Percentage of area within a province with a slope greater than 10% [Slope10]
   - Average slope of a province [Slavge]
   - Average elevation [Elavge]

The regressions in Table 3 show three robust results that suggest a common hypothesis: economic internationalization has become much more important in determining provincial income in the post-1978 period. The first is that the two proxies for easy coastal access increased greatly in statistical significance and in magnitude in 1998. For example, Pop100cr was significant in 1998 but not in 1952 and 1978, and its estimated coefficient rose from 0.23 in 1978 to 0.70 in one case and from 0.16 to 0.55 in the other case. These developments mean that the post-1978 reform have made the ability of a province to engage in international trade and to host FDI, an important determinant of provincial income.

The second robust result is that the "steepness" of land within a province was a greater challenge to raising provincial income in 1952 and 1978 than in 1998. To see how economic internationalization caused both the magnitude and statistical significance of the coefficients of Slope10 and Slavge to decrease, one must know that the inland parts of the southern

[9] The assumption is that the distribution of population across China did not change much in 1952–1998 because of the household registration system that kept people in the places where they were born.

Table 3
Relation of GDP per capita with physical geography in 1952, 1978, and 1998

Log of GDP per capita in year	Distf	Slope10	Pop100cr	Slavge	Elavge	R^2
1952	10.4820	− 0.0152				
	1.87	2.05				.36
1978	15.6354	− 0.0139				
	1.64	2.20				.33
1998	23.9460	− 0.0124				
	3.29	2.30				.49
1952		− 0.0164	0.2316			
		1.93	1.33			.23
1978		− 0.0182	0.2279			
		2.47	0.99			.14
1998		− 0.0111	0.7011			
		1.77	3.10			.35
1952	9.4092			− 0.0699	0.0000	
	1.87			2.21	0.18	.40
1978	15.1829			− 0.1001	0.0001	
	1.72			2.30	0.86	.39
1998	20.7180			− 0.0425	− 0.0001	
	3.09			0.88	1.39	.55
1952			0.1621	− 0.0786	0.0000	
			0.72	2.16	0.17	.28
1978			0.1936	− 0.1159	0.0000	
			0.68	2.24	0.37	.21
1998			0.5461	− 0.0582	− 0.0001	
			1.99	1.15	0.71	.39

Distf = 1/(1 + distance in kilometers), i.e., the inverse of distance from the sea.
Pop100cr = Percent of provincial population living within 100 km of coast or navigable part of rivers that flow to sea.
Slope10 = Percentage of area within a province with a slope greater than 10%.
Slavge = Average slope of a province.
Elavge = Average elevation.
Constant term not reported, and italicised figures are the absolute *t* statistics. GDP in 1995 prices.
$N = 28$ in 1952, Hainan data unavailable, Chongqing data included in Sichuan, and Tibet data unavailable.
$N = 29$ in 1978 and 1998, Chongqing data included in Sichuan, and Tibet data unavailable.

coastal provinces have fairly rugged mountains, which render agricultural activities arduous. After 1978, the income base of the southern coastal provinces moved rapidly from agriculture to industry, hence reducing "steepness" of the terrain as an obstacle to raising income.

The third robust result is that the R^2 is highest in 1998 and lowest in 1978. For example, the specification with Pop100cr and Slope10 reports an R^2 value of .35 for 1998, .14 for 1978, and .23 for 1952. This specifications fits the data better in 1998 than in 1978 because China had pursued autarkic policies in the two decades prior to 1978, hence weakening the trade channel through which geography asserts itself. The finding that the statistical fit in 1998 is much higher than in 1952 suggests at least two explanations. One, the world today is more integrated economically than in 1952, so the gains from economic internationalization in 1998 are now greater than in 1952. Two, favorable geographical location could have a

positive but slow and cumulative impact on income, hence yielding a substantial lag between geographical advantage and higher income level. Both of these explanations would predict that the coefficients and statistical significance of the geography variables in a growth regression would be larger in the later subperiods of the estimation period. This prediction is borne out in the growth regressions reported in the next section.

It should be noted that the results in Table 3 cannot dictate the nature of the results in the next section: the dependent variables, the regression specifications, and the time spans are different.

4. Provincial differences in growth rates (1978–1998): geography and policy

As mentioned earlier, our analysis of post-1978 regional growth will replace the black box of regional dummies that is common in the literature with two variables:

1. transportation cost and pure geography effect [*Pop100cr*]
2. a preferential policy index for each province [*Policy*]

We must stress that Policy is restricted to open-door preferential policies and does not take into account other factors, such as the business environment.[10] Table 4 reports the preferential policy index that is constructed by giving to each province a weight that reflects the type of economic zone that it hosts:

Weight = 3: SEZ and Shanghai Pudong New Area
Weight = 2: Economic and Technological Development Zone (ETDZ) and Border Economic Cooperation Zone (BECZ)
Weight = 1: Coastal Open City (COC), Coastal Open Economic Zone (COEZ), Open Coastal Belt, major city on Yangtze (MC), bonded area (BA), and capital city of inland province or autonomous region (CC)
Weight = 0: No open zone

Eqs. 1–3 in Table 5 regress the provincial output growth rate in the different subperiods of the reform era on the initial income level and the coast dummy.[11] The estimated coefficients

[10] Disentangling geography and policy is clearly not an easy task because preferential treatments are obviously related to geography; for example, Shenzhen was made an SEZ because it is located next to Hong Kong. Fortunately, the correlation between them appears far enough because of different types of zones and different timing in establishments of the zones. The coefficient of correlation between the average value of the policy index over 1978–1998 and the proportion of provincial population in 1994 with easy access to sea transportation [Pop100cr] is 0.54; more details given in Table 8.

[11] The subperiods correspond to different policy episodes: 1979–1984 was agricultural decollectivization, 1985–1991 was Oskar Lange-type of market socialism, and 1992–1998 was socialist market economy with Chinese characteristics (which include privatising most SOEs, and giving state and private capital equal constitutional protection).

Table 4
Preferential policy index

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	Average
Beijing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2	2	2	0.67
Tianjin	0	0	0	0	0	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1.43
Hebei	0	0	0	0	0	0	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	1.24
Shanxi	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0.33
Inner Mongolia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2	2	2	0.67
Liaoning	0	0	0	0	0	0	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	1.24
Jilin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2	2	2	0.67
Heilongjiang	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2	2	2	0.67
Shanghai	0	0	0	0	0	0	1	1	2	2	2	2	3	3	3	3	3	3	3	3	3	1.76
Jiangsu	0	0	0	0	0	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1.43
Zhejiang	0	0	0	0	0	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1.43
Anhui	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	2	2	2	2	2	0.62
Fujian	0	0	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2.71
Jiangxi	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0.33
Shandong	0	0	0	0	0	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1.43
Henan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0.33
Hubei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	2	2	2	2	2	0.62
Hunan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0.33
Guangdong	0	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2.86
Guangxi	0	0	0	0	0	0	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	1.24
Hainan	0	0	0	0	0	0	0	0	0	0	3	3	3	3	3	3	3	3	3	3	3	1.57
Sichuan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	2	2	2	2	2	0.62
Guizhou	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0.33
Yunnan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2	2	2	0.67
Tibet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0.33
Shaanxi	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0.33
Gansu	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0.33
Qinghai	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0.33
Ningxia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0.33
Xinjiang	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2	2	2	0.67

Table 5
Disentangling influence of geography and policy

	Period	Initial GDP	Coast	Pop100cr	Policy	Initial agriculture	Sq (initial agriculture)	Initial SOE size	R^2
Subperiod averaged									
Eq 1	1979–1984	−0.00413	0.01534						
		0.93	2.67						.22
Eq 2	1985–1991	−0.00050	0.02256						
		0.14	3.41						.35
Eq 3	1992–1998	0.01052	0.03179						
		1.55	5.17						.48
Eq 4	1979–1984	−0.00826		0.01229	0.00559				
		1.55		1.97	3.10				.23
Eq 5	1985–1991	−0.00729		−0.00925	0.01154				
		1.14		1.06	2.66				.32
Eq 6	1992–1998	−0.00723		0.04084	0.01040				
		1.12		7.57	1.57				.72
Eq 7	1979–1984	−0.00730		−0.00181	0.00419	−0.09185	0.19489	−0.10339	
		0.43		0.20	2.05	0.61	0.96	2.69	.39
Eq 8	1985–1991	0.01602		−0.00673	0.01056	0.29274	−0.40455	0.05279	
		0.92		0.60	2.37	1.46	1.22	0.97	.42
Eq 9	1992–1998	−0.01532		0.03276	0.01169	−0.07294	0.12132	−0.11435	
		1.51		5.85	2.43	0.49	0.38	3.13	.82
Entire period averaged									
Eq 10	1979–1998	0.00136	0.02480						
		0.46	5.95						.60
Eq 11	1979–1998	−0.00912		0.01244	0.01289				
		2.40		3.18	8.31				.71
Eq 12	1979–1998	−0.00894		0.00817	0.01160	−0.00963	0.01950	−0.04917	
		1.06		1.54	6.43	0.09	0.13	1.68	.76

Dependent variable: average growth rate of per capita GDP of province in indicated period.
Constant term not reported. Absolute *t* statistic in italic.

have the theoretically expected signs but the low *t* statistics of the output coefficient mean that conditional convergence does not characterise provincial output growth. The interesting result is that the coefficient of the coast dummy increases markedly in size over the subperiods, from 0.015 in 1979–1984 to 0.023 in 1985–1991, and then to 0.032 in 1992–1998. The growing influence of the coast on output growth is confirmed by the monotonic increase in its *t* statistics over time, from 2.98 in 1979–1984 to 5.11 in 1992–1998.

Eqs. 4–6 replace the coast dummy with Policy and Pop100cr. As will be seen, the magnitude of the Policy coefficient is stable over time (0.01), while the magnitude of the Geography coefficient increases over time (from 0 to 0.04). It therefore appears that the secular rise in the Pop100cr coefficient is responsible for the secular rise in the coast coefficient.

This large difference in the temporal profiles of the Policy coefficient and the Geography coefficient continues to hold in Eqs. 7–9, which are more sophisticated specifications. The

initial size of the agricultural sector is added because of its large share, and because China's economic reform started with the large-scale deregulation of this sector. The square of this term is also included because Tian (1999) had found a diminishing role for agriculture. The agriculture variables received no statistical support, however. The insertion of the initial size of the state sector variable is based on Sachs and Woo's (1994) argument that the maintenance of the existing state-owned sector would require the state to give state-owned enterprises (SOEs) priority access to capital, raw materials, and skilled manpower, hence making it difficult for new non-state enterprises, like rural industrial enterprises, to emerge. This SOE variable has the theoretically expected sign and strong statistical support in two of the three cases.

The results in Table 5 are confirmed in Table 6, which adds a metropolis dummy to prevent possible distortions caused by the presence of the atypical provinces of Beijing, Shanghai, and Tianjin. The contrasting time profiles of the Pop100cr and Policy coefficients emphasize the intuitively sensible point that the time lag between impact and effect could differ

Table 6
Effects of including the metropolis dummy

	Period	Initial GDP	Coast	Pop100cr	Policy	Initial agriculture	Sq (initial agriculture)	Initial SOE size	Metropolis dummy	R^2
Subperiod averaged										
Eq 1	1979–1984	−0.0141	0.0174						0.0187	
		1.77	2.95						1.87	.27
Eq 2	1985–1991	0.0007	0.0222						−0.0023	
		0.09	3.06						0.18	.35
Eq 3	1992–1998	0.0001	0.0375						0.0196	
		0.01	5.01						1.29	.51
Eq 4	1979–1984	−0.0135		0.0120	0.0061				0.0099	
		1.70		1.87	3.14				0.78	.24
Eq 5	1985–1991	−0.0012		−0.0089	0.0109				−0.0104	
		0.11		1.01	2.44				0.68	.33
Eq 6	1992–1998	−0.0048		0.0408	0.0098				−0.0039	
		0.45		7.44	1.36				0.37	.72
Eq 7	1979–1984	−0.0089		−0.0007	0.0036	0.0871	−0.0643	−0.0949	0.0251	
		0.58		0.08	1.73	0.38	0.21	2.47	1.37	.42
Eq 8	1985–1991	0.0148		−0.0073	0.0107	0.3569	−0.4952	0.0490	0.0100	
		0.82		0.62	2.31	1.66	1.43	0.84	0.46	.42
Eq 9	1992–1998	−0.0180		0.0318	0.0121	0.1544	−0.3064	−0.1273	0.0230	
		1.63		6.03	2.60	0.49	0.51	4.00	0.94	.83
Entire period averaged										
Eq 10	1979–1998	−0.0067	0.0265						0.0152	
		1.00	5.83						1.67	.63
Eq 11	1979–1998	−0.0122		0.0121	0.0133				0.0056	
		2.14		2.88	8.37				0.55	.72
Eq 12	1979–1998	−0.0104		0.0089	0.0116	0.1427	−0.2001	−0.0411	0.0217	
		1.27		1.74	6.08	1.40	1.36	1.46	2.03	.79

Table 7
The two standard deviation confidence interval (2SDCI) for the coefficients

Variable	Table no.	Eq. no.	Range of the 2SDCI for 1978–1984		Range of the 2SDCI for 1992–1998		Overlap of 2SDCIs?
Coast	5	1 and 3	0.0038	0.0268	0.0195	0.0441	yes
	6	1 and 3	0.0056	0.0292	0.0225	0.0525	yes
Pop100cr	5	4 and 6	−0.0002	0.0248	0.0301	0.0516	no
	5	7 and 9	−0.0198	0.0162	0.0216	0.0440	no
	6	4 and 6	−0.0008	0.0248	0.0298	0.0518	no
	6	7 and 9	−0.0179	0.0165	0.0213	0.0423	no
Policy	5	4 and 6	0.0020	0.0092	−0.0028	0.0236	yes
	5	7 and 9	0.0001	0.0083	0.0021	0.0213	yes
	6	4 and 6	0.0022	0.0100	−0.0046	0.0242	yes
	6	7 and 9	−0.0006	0.0078	0.0028	0.0214	yes

substantially among variables. In such situations, estimations based on averaging the variables over the entire time period or on pooling the data set would understate the coefficients of the slower acting variables. This point is clearly seen in Eqs. 10–12 of Tables 5 and 6.

We think that the wrong sign for the statistically insignificant Pop100cr coefficient in the 1985–1991 period resulted from the unusual 1989–1991 subperiod, which was a time of severe macroeconomic austerity and pervasive uncertainty about the future direction of state policies. Because we did not control for the large negative shock of 1989–1991, which pushed actual growth below potential growth, the effects of Pop100cr in 1985–1991 could not be identified, just like they were not present in 1958 and 1978 in Table 3 because of central planning.[12]

Table 7 constructs the two standard deviations confidence interval (2SDCI) for the coefficients of coast, Pop100cr, and Policy in 1979–1984 and 1992–1998. For the 1979–1984 coast coefficient and 1979–1984 Policy coefficient, their 2SDCIs overlap with the 2SDCIs of their counterparts in 1992–1998. In contrast, the 2SDCI of the 1979–1984 Pop100cr coefficient does not overlap with the 2SDCI of the 1992–1998 Pop100cr coefficient. The important finding here is that the Geography coefficient unambiguously increased over time, supporting the view that Geography is a slow-acting variable.

To summarise, Tables 5–7 show that conditional convergence is only hinted at, rather than statistically supported; the Policy coefficient generally is temporally stable in magnitude and statistical support across time; the Pop100cr coefficient increases in magnitude and statistical significance over time; all the specifications fit the data best in the 1992–1998 subperiod (as shown by R^2 being highest in 1992–1998). We attribute the third and fourth findings to the slow-acting nature of geographical forces.

[12] Demurger (2000, p.33) found that the inclusion of a 1989–1990 dummy was necessary in panel estimations of provincial growth regressions.

Strictly speaking, the regression results should be interpreted as indicators of the validity of two joint hypotheses, and not just of Hypothesis 2.

Hypothesis 1: Table 4 is a satisfactory characterization of China's preferential policy in the 1979–1998 period.

Hypothesis 2: The final set of regression specifications (Eqs. 7, 8 and 9) in Table 5 is a satisfactory characterization of provincial growth.

We find the results to be in broad agreement with these two joint hypotheses: the coefficients have the expected signs most of the time; none of the coefficients that have *t* statistics with absolute values greater than 1.2 are of the wrong sign; the main findings are robust to minor changes in specification, time period, and data partition. It seems highly implausible to us that two wrong hypotheses would offset each other in such a manner that they generate a statistical pattern that is implied when both hypotheses are true.

5. The economic mechanisms of preferential policies and geography

By government intent and design, the main growth mechanism of the provincial preferential policies is FDI. Geography, in comparison, manifests itself through two growth mechanisms: FDI and rural industrial enterprises. As most FDI in China, up to now, has been export motivated, FDI would (ceteris paribus) prefer provinces that provide easier access to sea transportation (which is what the Pop100cr variable is designed to proxy for). Since a large and growing proportion of China's exports are produced by rural enterprises (in many cases, initially as subcontractors to SOEs and foreign-funded enterprises), it has been natural for these export-oriented rural enterprises to be established in the coastal provinces. In turn, these rural enterprises generated agglomeration effects and backward economic linkages that induced new rural enterprises (not necessarily export oriented) to locate themselves in the same localities, thus making the coastal region a major growth area. The disproportionate concentration of rural enterprises in the seven coastal provinces explains why, in 1988, the coastal region accounted for 53% of the investment by China's rural enterprises when it accounted for 40% of national investment; and 31% of investment by China's SOEs. The 1998 numbers are 56%, 43%, and 35%, respectively. The opening of trade, in brief, allowed geography to establish FDI and rural industrial enterprises as its main growth mechanisms.[13]

Table 8 presents evidence to support the proposed effects of Policy and Pop100cr on FDI. The correlations among FDI, Policy and Pop100cr reported in Table 8A display two noteworthy results. First, the FDI–Policy link is stronger than the FDI–Pop100cr link. The correlation coefficient of FDI–Policy is larger than the correlation coefficient of FDI–

[13] Woo (1998) found that rural industrial enterprises accounted for almost 30% of the increase in output during 1985–1993. Woo (2001b) showed that the contribution from rural enterprises to industrial output growth nearly always equaled to that of the SOEs in 1984–1987 and exceeded it from 1988 onward.

Table 8
The role of preferential policy and geography nexus in the location of foreign direct investment

Part A: Degree of correlation among Pop100cr, Policy and FDI for different periods (italicised numbers refer to the level of statistical significance that the correlation is zero)

	FDI	Policy		FDI	Policy				
			1979–1984			1985–1991			
Policy	0.8229			0.6039					
	0.000			0.001					
Pop100cr	0.211	0.2925		0.3886	0.6593				
	0.272	0.124		0.038	0.000				
			1992–1998			1979–1998			
Policy	0.7539			0.8000					
	0.000			0.000					
Pop100cr	0.5968	0.4909		0.5642	0.581				
	0.001	0.007		0.001	0.001				

Part B: Addition of FDI tends to reduce significance of policy and geography variables

	Period	Initial GDP level	Pop100cr	Policy	Initial size of agriculture	Sq (initial size of agriculture)	Initial SOE size	Metropolis dummy	FDI	R^2
Eq 1	1979–1984	−0.0089	−0.0007	0.0039	0.0862	−0.0629	−0.0946	0.0250	−0.0864	
		0.56	0.08	1.25	0.37	0.20	2.39	1.34	0.12	.42
Eq 2	1985–1991	−0.0103	−0.0049	0.0035	0.4773	−0.7293	0.0099	0.0171	1.0713	
		0.52	0.55	0.98	2.13	2.25	0.16	0.86	4.32	.61
Eq 3	1992–1998	−0.0183	0.0331	0.0133	0.1602	−0.3245	−0.1230	0.0240	0.0276	
		1.62	4.72	2.26	0.49	0.52	3.43	0.96	0.37	.83
Eq 4	1979–1998	−0.0095	0.0084	0.0090	0.1741	−0.2501	−0.0471	0.0223	0.1068	
		1.11	1.66	1.77	1.72	1.70	1.46	2.05	0.72	.79

Dependent variable: average growth rate of per capita GDP of province in indicated period constant term not reported, absolute t statistic in italic. $N=29$, Tibet (missing data), and Chongqing data included into Sichuan.

Pop100cr for all time periods, suggesting that Policy had a greater influence than Pop100cr in determining the location of FDI. This suggestion is bolstered by the fact that the FDI–Policy correlation coefficient is always strongly statistically significant (with the weakest link at the 0.1% significance level in 1985–1991), which is not true of the FDI–Pop100cr correlation coefficient.

Second, geography became a bigger determinant in the location decision of FDI over time. The FDI–Pop100cr correlation coefficient rose from 0.211 in 1979–1984 to 0.389 in 1985–1991, and then to 0.597 in 1992–1998. (These figures are still smaller than the smallest FDI–Policy correlation coefficient, 0.604 in 1985–1991.) The tightening of the FDI–Pop100cr link over time is due to the gradual extension of preferential policies to other provinces, and to geography having a longer lag on FDI compared to Policy.

To make our point that FDI is one of the economic growth mechanisms enabled by the Policy and Pop100cr variables, Table 8B reports the regression results of adding FDI into the preferred specification in Table 6. FDI received strong statistical support in only one of the four cases, and its presence reduced the *t* statistics of Policy and Pop100cr in every case. The results support our hypotheses that FDI into China and its distribution within China has largely been induced by Policy and Pop100cr.

6. Growth quantification and simulation

Table 9 uses the minimum and maximum values of the estimated coefficients of Pop100cr and Policy in 1992–1998 from Tables 5 and 6 to quantify the range of the growth contributions from geographical location and preferential policies to the growth rates of provinces in the different regions in the 1996–1999 period. It is surprising that there is only one case, the coastal region, where the range of the growth contributions from Pop100cr overlaps with the range from Policy; 2.6–3.3 and 2.4–2.9 percentage points, respectively. Furthermore, there is only one case, the central region, where geography was unambiguously more influential than preferential policies—and this occurred largely because of the Yangtze being navigable for a long way upstream. Understandably, Policy has had more impact than Pop100cr in the growth of the western provinces.

The metropolises resemble the coastal provinces in enjoying large boosts from Pop100cr and Policy. There is, however, no overlap in the two ranges for the metropolises, because they are so pampered that their lowest growth contribution from Policy equals the highest growth contribution to coastal growth from Policy.

The growth decomposition yields two important observations for economic policy. First, the faster growth of the coastal provinces could not be largely attributed to the more preferential policies that they had received. The coastal location was probably marginally more important than preferential policies in promoting growth. Second, despite the significant easing of regulations on FDI and international trade in the interior provinces since 1992, the regional differences in Policy in 1996–1998 were still quite large, causing at least a 1.5-percentage point growth gap between the metropolises and the central, northwestern, and southwestern provinces.

Table 9
Contributions of geography and preferential policy to growth in 1996–1999 and policy simulations

Location of province	Average actual value in 1996–1999 period			Range of geography effects on GDP growth (percentage points)		Range of policy effects on GDP growth (percentage points)		Counterfactual GDP; GDP growth when Policy = 0 (%)		Counterfactual GDP; GDP growth when Policy = 2 (%)	
	GDP growth	Pop100cr	Policy	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
Metropolis	9.88	0.71	3.00	2.25	2.88	2.94	3.63	6.25	6.94	8.67	8.90
Northeast	9.19	0.18	2.00	0.56	0.72	1.96	2.42	6.77	7.23	9.19	9.19
Coast	10.72	0.82	2.43	2.60	3.34	2.38	2.94	7.78	8.34	10.20	10.30
Central	10.28	0.57	1.33	1.82	2.34	1.31	1.61	8.67	8.98	10.94	11.09
Northwest	9.32	0.00	1.33	0.00	0.00	1.31	1.61	7.70	8.01	9.97	10.12
Southwest	8.80	0.04	1.50	0.12	0.16	1.47	1.82	6.99	7.33	9.29	9.41

Decomposition and simulations were done using the minimum and maximum values of the estimated coefficients of Pop100cr and Policy.

The last four columns in Table 9 simulate the growth consequences of Policy. For the counterfactual scenario of Policy=0 for all provinces (i.e. no preferential treatment for FDI in any location), the central provinces would have shown the highest growth rates (8.7–9.0%) in 1996–1999, but the coastal provinces would still have grown faster than the northeastern, northwestern, and southwestern provinces. Furthermore, because the preferential policies had a positive impact on the growth of the inland provinces, the elimination of preferential policies to equalize policy treatment across provinces would have been a negative shock to the inland provinces. Since the troubling aspect about the preferential policies was not their effectiveness, but the unequal access to them, the solution lies in increasing the access of the inland provinces to the preferential policies rather than in denying these policies to everyone. For the counterfactual growth scenario of Policy = 2 for all provinces, the outcome would have been a higher national GDP growth rate and a reduction in the coefficient of variation for provincial income (because the poorer provinces would have grown faster, and the growth rates of the metropolises would have been at least 1 percentage point lower).

7. What is to be done?

The presence of only conditional convergence and not unconditional convergence in China stands in marked contrast with Barro and Sala-i-Martin's (1995) finding of unconditional convergence in the United States. We see several Chinese institutions that have been inhibiting the income convergence process generated by factor movement and by the Stolper–Samuelson mechanism. The household registration (hukou) system makes it illegal for rural labor to move to urban areas. The monopoly state bank system favors the SOEs, and most SOEs are located on the coast and in the northeast.[14] The decentralization reforms of 1984–1988 unleashed local protectionism, and it appears from the recent research of Young (2000) and Poncet (2001) that the decentralization reforms that restarted in 1992 might have brought local protectionism to new heights. The crucial point here is that there are other important factors that contributed to the widening of regional disparity besides geographical location and selective economic internationalization.

The government clearly recognizes the great importance of providing infrastructure to overcome production bottlenecks and facilitate international economic integration. Infrastructure construction stands first in the following list of priority tasks in the strategy to develop the western provinces (State Council, 2000):

- developing infrastructure
- improving and protecting the environment
- strengthening agriculture
- restructuring industry

[14] This behavior of the monopoly state bank system may explain why Fan, Robinson, and Zhang (forthcoming) has found that the marginal rates of return to capital in agriculture, urban industry, urban services, and rural enterprise have diverged since 1985. The Gini coefficient was 0.16 in 1978, 0.11 in 1985, and 0.21 in 1995.

- promoting tourism
- enhancing science, technology, education, culture, and public health

In our opinion, science, technology, education, and public health have been given too low a ranking in the above priority list. This concern stems from our belief that, once a market economy is in place, technological advancement is the fundamental engine of sustainable development. The ultimate prize of western development efforts is the successful incubation of two or three centers of endogenous growth in western China. If the incubation effort is regarded as too ambitious then the realistic objective is to create sufficient local scientific capacity to hasten the diffusion of new technologies from the coastal provinces and foreign countries to western China. Finally, human capital formation has a much lower wastage rate than physical capital formation because humans can move but bridges and tunnels cannot move, in order to contribute to the technological progress in other locations within China.[15]

It must be recognised that the so-called "preferential policies" are in essence "deregulation policies" to marketize and internationalize these coastal economies so that they could operate in an economic environment closer to those of their East Asian neighbors (and competitors). The adjective "preferential" gives the misleading sense that the prosperity of these coastal economies had been mostly sustained by a steady flow of state subsidies, and this has not been the case. There was certainly pump priming in the beginning (i.e., state funds to build the infrastructure that would make these economic zones attractive as export platforms), but there have not been significant steady transfers to prop up failing enterprises in order to maintain the living standard in the region, as in the case of the northeastern provinces. The state should accelerate the extension of these deregulation policies to the other provinces rather than to reverse them for the coastal provinces as have been proposed. Furthermore, deregulation must be expand to cover the household registration system, the monopoly state bank system, and local protectionism. An effective strategy to develop the western provinces must therefore encompass physical capital formation, human capital formation, and institutional capital formation.

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[15] Demurger et al. (2001) added infrastructure and education variables to the regressions, and these coefficients almost always had the right sign but were usually statistically insignificant. We attribute the weak statistical support to estimating too many parameters for the number of observations, and not to the irrelevance of infrastructure and education to economic growth. Demurger (2000, 2001) provide strong evidence of their importance to growth.

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