INTERNATIONAL FOOD
POLICY RESEARCH INSTITUTE
sustainable solutions for ending hunger and poverty
Supported by the CGIAR

IFPRI Discussion Paper 00713

August 2007

Resource Abundance and Regional Development in China

Xiaobo Zhang, International Food Policy Research Institute
Li Xing, Chinese Academy of Agricultural Sciences (CAAS)
Shenggen Fan, International Food Policy Research Institute
and
Xiaopeng Luo, Zhejiang University and Guizhou University

Development Strategy and Governance Division

INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

The International Food Policy Research Institute (IFPRI) was established in 1975. IFPRI is one of 15 agricultural research centers that receive principal funding from governments, private foundations, and international and regional organizations, most of which are members of the Consultative Group on International Agricultural Research (CGIAR).

FINANCIAL CONTRIBUTORS AND PARTNERS

IFPRI's research, capacity strengthening, and communications work is made possible by its financial contributors and partners. IFPRI gratefully acknowledges generous unrestricted funding from Australia, Canada, China, Denmark, Finland, France, Germany, India, Ireland, Italy, Japan, the Netherlands, Norway, the Philippines, Sweden, Switzerland, the United Kingdom, the United States, and the World Bank.

INTERNATIONAL FOOD
POLICY RESEARCH INSTITUTE
sustainable solutions for ending hunger and poverty

IFPRI®

Supported by the CGIAR

IFPRI Discussion Paper 00713

August 2007

Resource Abundance and Regional Development in China

Xiaobo Zhang, International Food Policy Research Institute
Li Xing, Chinese Academy of Agricultural Sciences (CAAS)
Shenggen Fan, International Food Policy Research Institute
and
Xiaopeng Luo, Zhejiang University and Guizhou University

Development Strategy and Governance Division

Published by

INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

2033 K Street, NW
Washington, DC 20006-1002 USA
Tel.: +1-202-862-5600
Fax: +1-202-467-4439
Email: ifpri@cgiar.org

www.ifpri.org

Notices:

[1] Effective January 2007, the Discussion Paper series within each division and the Director General's Office of IFPRI were merged into one IFPRI-wide Discussion Paper series. The new series begins with number 00689, reflecting the prior publication of 688 discussion papers within the dispersed series. The earlier series are available on IFPRI's website at www.ifpri.org/pubs/otherpubs.htm#dp.

[2] IFPRI Discussion Papers contain preliminary material and research results. They have not been subject to formal external reviews managed by IFPRI's Publications Review Committee but have been reviewed by at least one internal and/or external reviewer. They are circulated in order to stimulate discussion and critical comment.

Contents

List of Tables

List of Figures

ACKNOWLEDGEMENTS

The authors acknowledge funding support provided by the Natural Science Foundation of China (Approval number 70525003). The authors also thank staff and students from the International Center for Agricultural and Rural Development (ICARD) for their help in inputting data. The authors are grateful for the comments from Regina Birner, Erwin Bulte, Xinshen Diao, Nico Heerink, Samuel Morley, one anonymous reviewer, and participants of the Chinese Economists Society annual meetings at Changsha and of seminars held at the International Food Policy Research Institute, Wageningen University, and Zhejiang University.

ABSTRACT

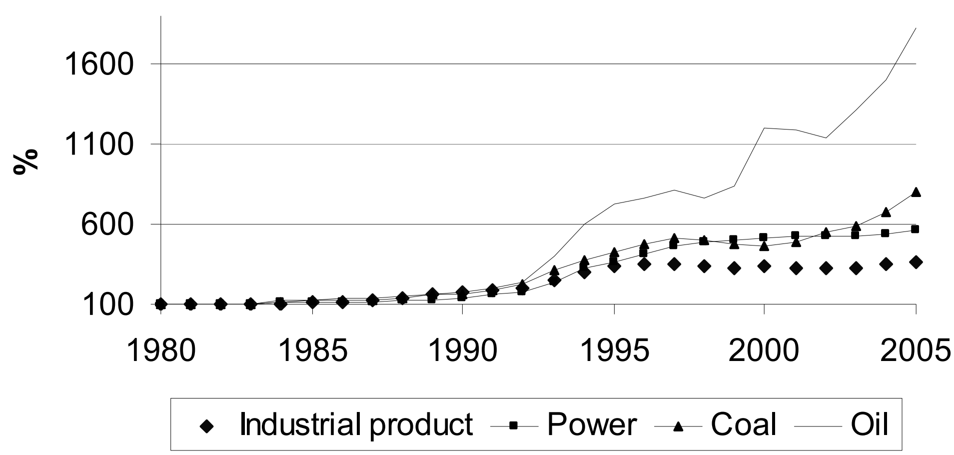
Over the past several decades, China has made tremendous progress in market integration and infrastructure development. Demand for natural resources has increased from the booming coastal economies, causing the terms of trade to favor the resource sector, which is predominantly based in the interior regions of the country. However, the gap in economic development level between the coastal and inland regions has widened significantly. In this paper, using a panel data set at the provincial level, we show that Chinese provinces with abundant resources perform worse than their resource-poor counterparts in terms of per capita consumption growth. This trend that resource-poor areas are better off than resource-rich areas is particularly prominent in rural areas. Because of the institutional arrangements regarding property rights of natural resources, most gains from the resource boom have been captured either by the government or state owned enterprises. Thus, the windfall of natural resources has more to do with government consumption than household consumption. Moreover, in resource-rich areas, greater revenues accrued from natural resources bid up the price of non-tradable goods and hurt the competitiveness of the local economy.

Keywords: China; regional inequality; resource curse; Dutch disease; property rights

1. INTRODUCTION

Over the past several decades, China has made tremendous progress in market integration and infrastructure development (Bai *et al.,* 2004; Fan and Chang-Kan, 2005; Zhang and Tan, 2007). Market reforms have eased restrictions on the flows of products, labor, and capital. The newly built inter-provincial highway system provides better transport links between regions and promotes trade flow. Rapid productivity growth has lowered the price of manufactured goods and led to soaring demand for raw materials, which are supplied by the natural resource-abundant interior regions. As shown in Figure 1, the terms of trade have shifted in favor of the resource sector. Given this situation—increasing market integration, better transport systems, and more favorable terms of trade—growth theory predicts regional convergence. However, the gap in living standards between the coastal and inland regions has widened (Kanbur and Zhang, 1999, 2005), as shown in Table 1. Various explanations to this puzzle have been put forward, including agglomeration, biased development policy, decentralization, and globalization (Démurger *et al.*, 2001; Hu, 2002; Zhang and Zhang, 2003; Zhang, 2006). However, few studies have examined the link between natural resource endowment and the imbalance in regional development patterns in China.[1]

Figure 1. Price Index for Industrial Products and Energy



Natural resources serve as important capital in economic development. In principle, revenues generated from the natural resource sector should be good for the economy. However, many resource-rich countries have worse economic performance than their resource-poor counterparts, a phenomenon known as the "resource curse." In the present study, we seek to link the two strands of the literature on regional

[1]Xu and Wang (2006) is one of the few Chinese papers we have found on this topic.

inequality and resource curse to explain the rapidly increasing inequality between resource-rich and resource-poor regions in China from the viewpoint of the resource curse.

In this study, we make use of a provincial-level panel data set from China. The unique characteristics of China make it particularly suitable for testing whether natural resource abundance has a statistically significant negative impact on economic development. First, the institutional and governance structures are rather homogeneous across provinces. Second, in terms of population and geographic size, many Chinese provinces are as large as countries and there are large regional variations in terms of resource endowment and development. The homogeneous institutional structure and large temporal and spatial variations enable us to better identify the effect of natural resources on growth and distribution.[2]

The results show that provinces with abundant resource wealth grow slower than their resource-poor counterparts in terms of per capita consumption, particularly in rural areas. We explain this phenomenon primarily from the perspective of property rights. Due to the arrangement of property rights on natural resources, local residents, in particular farmers, do not enjoy a fair share of the rise in rents associated with the booming natural resource sector. Most rents go to the government and state-owned enterprises (SOEs). Moreover, greater revenues accrued from natural resources lead to increased prices for non-tradable goods and hurt the competitiveness of local economies.

The next section offers empirical evidence of the negative impact of resource abundance on consumption growth. Section 3 analyzes the transmission channels of natural resources. Finally, in Section 4 we present our conclusions and explore policy implications. The data used in the analysis are described in the Appendix.

[2] In spirit, the paper echoes the work of Papyrakis and Gerlagh (2007), who examine resource abundance and regional economic growth by making use of state level data in the United States.

Table 1. Summary Statistics by Region and Year

Region	Year	Per capita GDP	Per capita consumption	Per capita rural consumption	Resource share	Population share	GDP share	Per capita resource (kg CE)	Resource/GDP (TNCE/10000 yuan)
Inland	1985	625	310	248	72.2	59.1	45.8	979	15.7
	2005	3,497	1,046	696	77.7	56.4	36.5	1,926	5.5
	Annual growth rate (%)	9.0	6.3	5.3	0.4	–0.2	–1.1	3.6	–5.4
Coast	1985	1,069	396	318	27.8	40.9	54.2	546	5.1
	2005	7,857	1,766	1,063	22.3	43.6	63.5	715	0.9
	Annual growth rate (%)	10.5	7.8	6.2	–1.2	0.3	0.8	1.4	–8.7

Note: Calculated by authors. The units of per capita GDP and consumption are in 1985 yuan.

2. IS THERE A RESOURCE CURSE IN CHINA?

The cross-country empirical growth literature has shown mixed evidence to support the curse of natural resources. By looking at the period of 1970–1989 when oil prices plummeted, Sachs and Warner (2001) show strong empirical support for the hypothesis. However, if the period is extended to a later time, the findings do not hold (Auty, 2001). In addition, it is hard to control for institutional factors and rigorously test the hypothesis in a strictly controlled environment for cross-country data sets. When institutional factors are accounted for, the direct negative impact of resource abundance vanishes (Bulte, Damania, and Deacon, 2005; Mehlum, Moene, and Torvik, 2006).

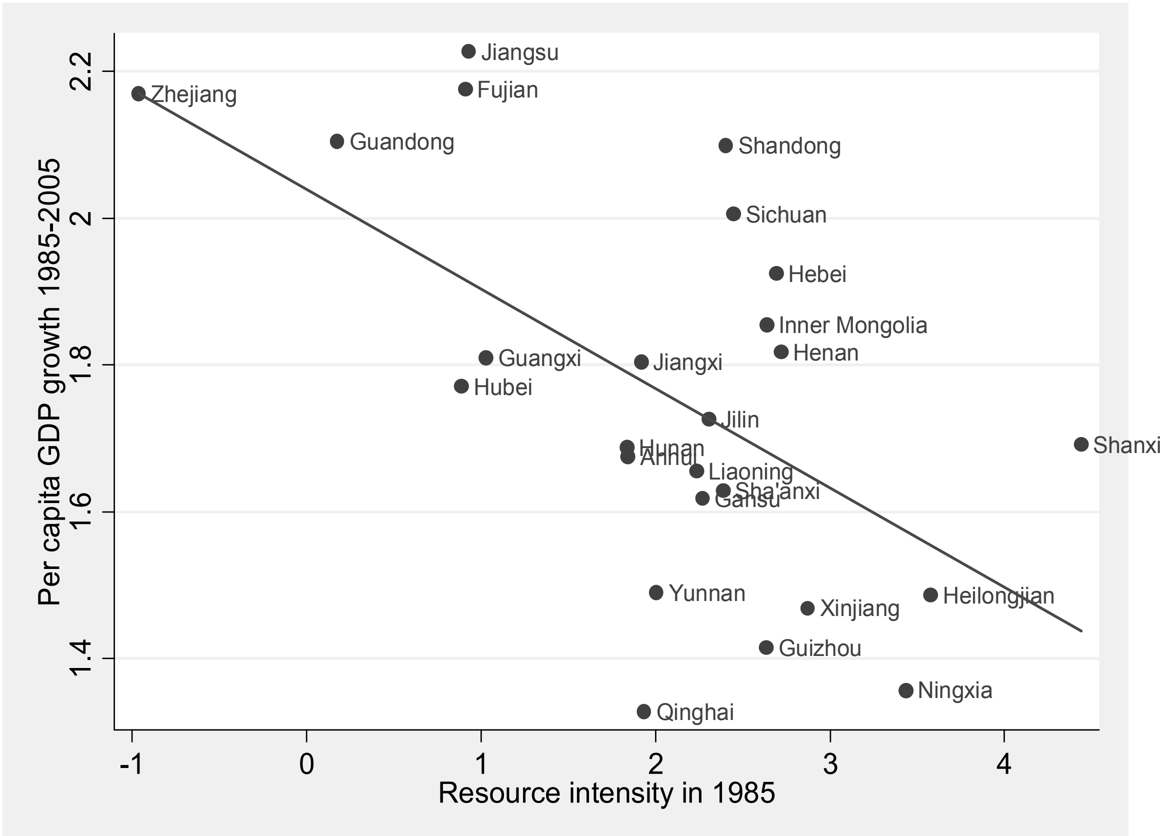
Due to the large size of Chinese provinces and homogenous governance structures, China provides a good test ground for examining whether the resource curse is a real phenomenon. Following the spirit of Sachs and Warner (2001), Figure 2 plots per capita GDP growth from 1985 to 2005 against a resource intensity variable, namely the ratio of resource production to total GDP in 1985.[3] Resource production is defined as the total standard energy units of coal, oil, natural gas, and hydraulic power. See the Appendix for details on the data sources. The figure shows a negative link between natural resource abundance in 1985 and the growth rate of per capita GDP in the following two decades. Most provinces with rapid growth started as resource poor, such as Zhejiang Province, while resource rich provinces, such as Guizhou, Shanxi and Heilongjiang, grow slower than average. Figures 3 and 4 reveal the same negative associations of resource abundance with change in per capita consumption and poverty.[4] These findings thus suggest that resource abundance is more closely related to per capita consumption growth than to GDP growth.

The bivariate plots in Figures 2–4 show a negative relationship between the resource intensity variable and several outcome variables. However this finding should be viewed with caution, as confounding variables may have given rise to the observed negative association. For example, the negative correlation may be due to geographic factors, because most natural resources are produced in remote areas. That is, the remoteness of the production site rather than the resource abundance may be the causal factor. Therefore, multivariate analysis must be used to control for key variables.

[3] Ideally, we should use resource stocks as a measure of resource abundance. However, systematic stock data at the provincial level are not available for the resource variables used in this paper.

[4] The vertical axis label in Fig.4 is only for 1988–1999 as opposed to the other 1985–2005 data in Figs. 2 and 3.

Figure 2. GDP Growth and Resource Abundance

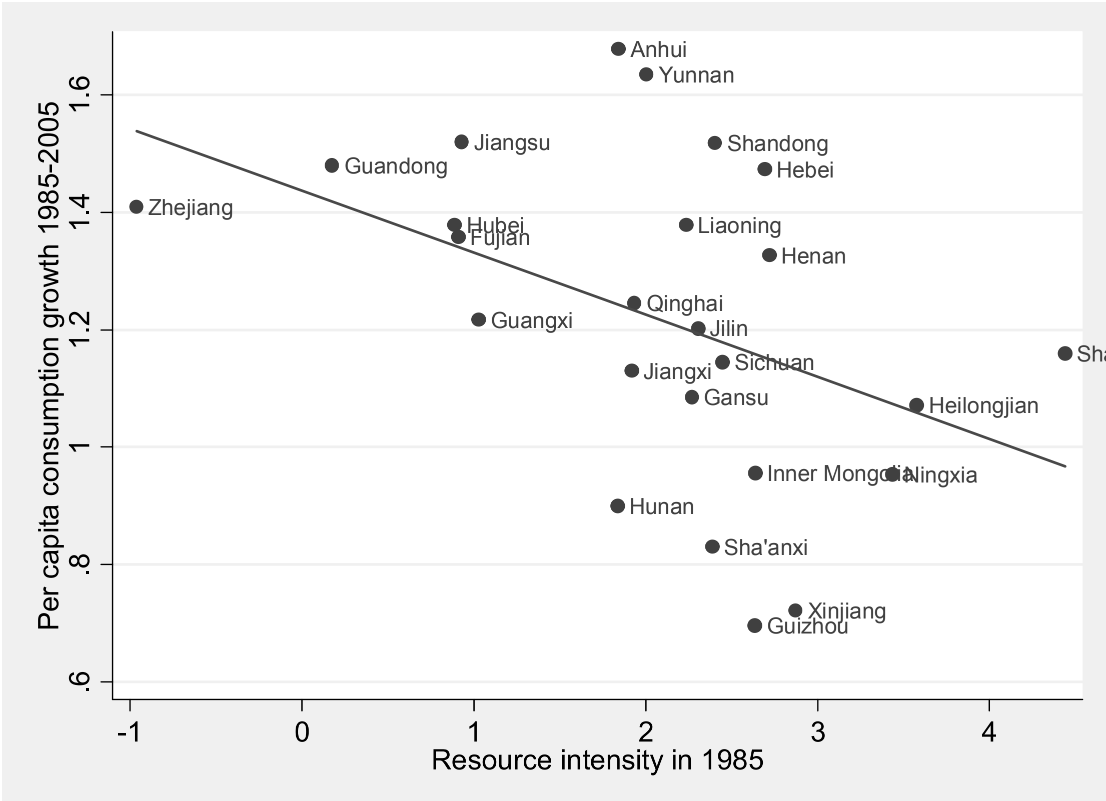


Note: The resource intensity variable is in logarithmic form.

Before undertaking more rigorous quantitative analyses, we first briefly review the history of price reform in China's natural resource sector.[5] In the planned economic era (1949–1978), the state artificially set low prices for minerals and other natural resources to support the manufacturing sector, which largely consisted of SOEs and was concentrated in resource-poor provinces. Since 1978, China has implemented a series of price reforms. From 1979 to 1984, the general price reform focused on lifting controls on consumer prices. The state, on realizing that low energy prices hindered supply, the price was increased on three separate occasions, in the period of 1979–1983. In 1984, the state permitted collectively owned and local government-owned coal mines to sell coal at the market price.

[5]This review is largely drawn from Chen and Zeng (1997) and Zhang (2000).

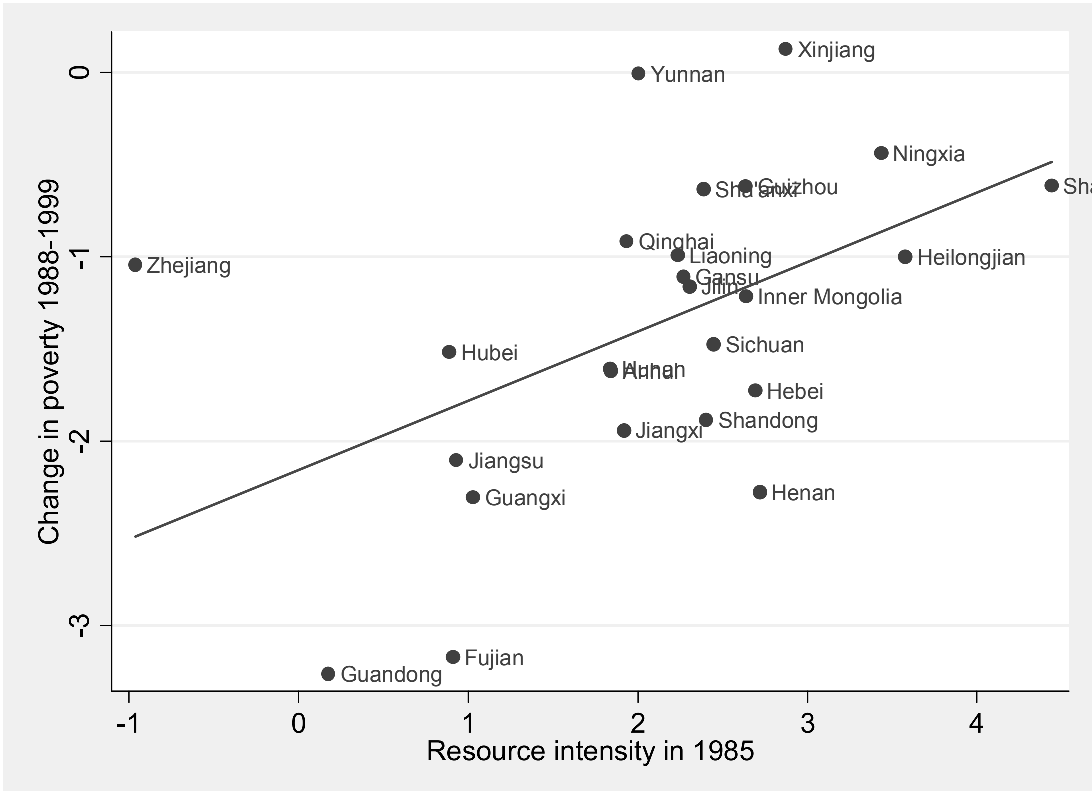
Figure 3. Consumption Growth and Resource Abundance



Note: The resource intensity variable is in logarithmic form.

A milestone in price reform occurred in 1985, when a dual-track system was put in place. Prior to this reform, SOEs under the control of the central, provincial, or municipal governments, enjoyed privileged access to a variety of scarce materials through quotas. There were few quotas, however, for other lower-level SOEs and even fewer for collectively owned enterprises. The dual pricing system allowed SOEs to sell unused input quota at market price to township and village enterprises, which were outside the command economy. This dual-track system presented a price-discovery mechanism. The planned and market prices gradually converged. By 1993, the coal price was largely liberalized, except for the portion earmarked for electricity generation, which was still subject to state price control and accounted for about 30% of total output. In October 1993, the state introduced a dual-track system for crude oil production. Under this system, crude oil produced outside the state quota could be sold at the market price. On May 1, 1994, the state raised the planned price for crude oil to bring it into line with the international market price.

Figure 4. Change in Poverty and Resource Abundance



Note: The resource intensity variable is in logarithmic form.

In summary, there has been a continuous process of price liberalization from the late 1970s to the mid-1990s in China. Under the price control regimes in place during this period, the resource curse may have resulted from China's heavy industrial-oriented development strategies and may have had little to do with the traditional resource curse. Only after reforms, when the energy price reflected market supply and demand, did the original interpretation of the resource curse discussed in the literature become relevant to China. Therefore, in our analyses presented below, we not only cover the whole sample period of 1985–2005, but also the sub-period of 1995–2005, during which energy and raw material prices were liberalized.[6]

As a first step, we examine the link between resource abundance and several outcome variables for the whole period and the post-price liberalization period using cross-provincial data (Table 2). The upper panel reports the regression results for the whole period of 1985–2005, while the lower panel lists the results obtained when the same regressions were repeated for the post-price liberalization period of 1995–2005. The regressions estimate the relationship between historical resource abundance and the growth in outcome variables conditional on the initial value of the dependent variable. The outcome

[6]China did not publish energy production data by province until 1985. The rural poverty data at the provincial level provided by Ravallion and Chen (2007) are only available from 1988 to 1999.

variables include the change in the logarithmic values of per capita GDP, per capita consumption, per capita rural consumption, and the change in rural poverty incidence. The regressors include the logarithm of the initial value of the dependent and resource intensity variables. The initial value of the dependent variable can help capture the mean reversion property of most economic variables. A negative coefficient for the variable suggests growth convergence across provinces. The resource intensity is defined as the ratio of resource production to total GDP in the first year of the sample period.

For the whole period of 1985–2005 (upper panel, Table 2), the coefficient for the resource variable is negative and statistically significant in all four regressions, providing tentative evidence in support of the presence of a resource curse. For the post-price liberalization period (lower panel, Table 2), by contrast, the coefficient for the resource variable is only significant in the regression on rural consumption growth. However, given the potential problem of omitted variables in cross-sectional regressions, this finding is only suggestive. It seems that the results are not robust to the sample period covered.

With only 25 observations, it is difficult to add more control variables to test the robustness of the results more rigorously.[7] To overcome this constraint, we divide the two-decade period into four five-year sub-periods and create a panel data set with 100 observations. The resulting larger data set enables us to control for more factors by taking advantage of the panel structure.

Table 2. The Impact of Resource Intensity on Change in Several Outcome Variables from 1985 to 2005 and from 1995 to 2005

	Per capita GDP	Per capita consumption	Per capita rural consumption	Rural poverty
1985–2005				
Initial value	0.099	–0.079	–0.201	–0.033
	(0.67)	(0.31)	(0.66)	(3.02)***
Resource intensity	–0.130	–0.109	–0.106	0.446
	(3.98)***	(3.54)***	(3.19)***	(2.65)**
Adjusted R-squared	0.289	0.120	0.080	0.331
1995–2005				
Initial value	–0.04	0.091	0.035	
	(0.42)	(0.83)	(0.30)	
Resource intensity	–0.023	–0.028	–0.036	
	(0.99)	(1.49)	(2.48)**	
Adjusted R-squared	–0.058	0.066	0.078	

Note: Robust *t* statistics in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%. Due to a lack of data, the rural poverty regression is from 1988 to 1999.

[7] Due to a lack of data, Tibet, Hainan, and Chongqing are not included. In addition, the three principal cities, Beijing, Shanghai and Tianjing, are excluded from our analysis on account of their special status and negligible natural resource base. The main results remain the same if these areas are included.

Table 3 presents the estimated results on the link between resource abundance and per capita GDP growth obtained using the above panel data set for six distinct specifications. Once again, we run the regressions for the whole period (1985–2005) and the post-price liberalization period (1995–2005). In all the specifications, we include year dummy variables to control for time-specific effects. The resource intensity variable is defined as the ratio of resource production to comparable GDP in the initial year of each panel period.[8] The terms of trade variable is defined as the ratio of the fuel price index to the overall retail price index used in 1985 as a base.[9] Due to the location-specific nature of resource variables, we cannot add provincial dummy variables, which are highly correlated with the resource intensity variable, in the regressions.

The independent variables in the first regression include the initial value of per capita GDP, the resource intensity, and the change in the terms of trade for the resource sector. For the whole period (upper panel, Table 3), the resource intensity variable has a significant negative coefficient, indicating the possible existence of the resource curse. The coefficient for the terms of trade variable is also statistically significant. For the post-price liberalization period (lower panel, Table 3), however, neither the coefficient for the resource intensity variable, nor that for the terms of trade variable, is significant.

In the second regression, the coastal dummy variable is added to capture potentially omitted variables, such as the geographic advantage of the coast along with globalization and coast-biased development policies. In the third regression, we replace the coastal dummy variable with explicit geographic (the share of population living within 100 kilometers from the coast) and policy variables taken from Démurger *et al*. (2001). When these variables are included, the coefficient for the resource intensity variable is nonsignificant for both the whole period and the post-price liberalization period. In China, most natural resources are concentrated in the inland regions. As a result, the resource variable is highly associated with the coastal dummy, geographic, and policy variables mentioned above.[10]The resultant multicollinearity problem poses a challenge to empirically disentangle the impact of resource abundance.

[8]Sachs and Warner (2001) argue that the share of resource production in GDP is a better measure than per capita resource production as it captures the importance of natural resources in the economy. Nonetheless, to test the robustness of our results, we also perform all the regressions in Tables 2-5 using alternative measures of resource intensity, including per capita resource production in 1985, per capita resource production in the initial year of each panel period, and the ratio of resource production to GDP in 1985. The basic findings are the same. The detailed regressions are available upon request.

[9]We also use the ratio of the fuel price index to the GDP deflator at the provincial level as an alterative measure. The results are similar.

[10]Its correlation coefficients with the coastal dummy, share of population within 100 km from coast, and policy variables are -0.46, -0.50, and -0.63, respectively.

Table 3. Per Capita GDP Growth and Resource Abundance

	R1	R2	R3	R4	R5	R6
1985–2005						
Initial per capita GDP	0.037	0.028	0.028	0.039	0.034	0.033
	(2.99)***	(2.09)**	(1.89)*	(3.21)***	(2.24)**	(2.38)**
Resource intensity	–0.019	–0.012	–0.012	0.003	0.002	
	(1.81)*	(1.22)	(0.96)	(0.25)	(0.20)	
Change in terms of trade	0.149	0.136	0.136	0.100	0.094	
	(2.04)**	(1.91)*	(1.84)*	(1.77)*	(1.58)	
Coastal dummy		0.043				
		(1.79)*				
Pop ≤ 100 km from coast			0.026			
			(0.67)			
Policy			0.013			
			(0.86)			
Distance to nearest seaport					–0.013	–0.017
					(0.59)	(0.80)
Observations	100	100	100	68	68	68
Adjusted R-squared	0.537	0.544	0.532	0.532	0.528	0.527
Omitting variable test *p*-value	0.016	0.01	0.011	0.284	0.251	0.007
1995–2005						
Initial per capita GDP	0.031	0.035	0.035	0.037	0.030	0.028
	(2.67)**	(2.45)**	(1.86)*	(2.10)**	(1.24)	(1.30)
Resource intensity	0.003	–0.001	0.001	–0.001	–0.002	
	(0.31)	(0.07)	(0.09)	(0.08)	(0.13)	
Change in terms of trade	0.210	0.236	0.208	0.286	0.280	
	(1.34)	(1.36)	(1.16)	(1.38)	(1.28)	
Coastal dummy		–0.019				
		–0.64				
Pop ≤ 100 km from coast			0.008			
			–0.13			
Policy			–0.019			
			–0.77			
Distance to nearest seaport					–0.02	–0.022
					–0.53	–0.64
Observations	50	50	50	34	34	34
Adjusted R-squared	0.275	0.264	0.253	0.198	0.183	0.200
Omitting variable test *p*-value	0.999	0.964	0.929	0.838	0.734	0.553

Note: Robust *t* statistics in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%. The year dummies, which are not reported here, are jointly significant in all the specifications.

Considering that the geographic and policy variables vary to only a small degree in the inland region, in the next three regressions we use only the inland sample to take advantage of the fact that variations in the geographic and policy variables will not obscure regional variations of the resource variable within the inland region. In so doing, we can separate the geographic and policy effects from the resource effect to a large degree. As indicated in the results obtained using only the inland region sample for the whole period (specification R4, upper panel, Table 3), the terms of trade variable appears to have a significant positive impact on GDP growth. When the distance to the nearest seaport is included (specification R5), the significance of this association between the terms of trade variable and GDP growth drops slightly. For the period of 1995–2005 (lower panel, Table 3), however, the coefficients for the terms of trade variable in R4 and R5 are not significant.

To control for the possibility that the high correlation between the resource intensity and distance variables may mask the inference precisions in the last regression, we replace the resource variable with the distance variable. When this is done, the coefficient for the distance to nearest seaport variable is nonsignificant in both specifications. Overall, the initial per capita GDP has a positive coefficient in all the specifications when the resource variable is included, indicating a divergence in regional growth in both 1985–2005 and 1995–2005. However, the results showing a negative impact of resource intensity on GDP growth are not robust to variations in the specifications and the sample period considered.

It has been argued that GDP growth is an imperfect welfare indicator (Bulte, Damania, and Deacon, 2005). In Tables 4 and 5, we examine the impact of resource abundance on per capita consumption growth and per capita rural consumption growth following a parallel specification, as in Table 3. For the whole period, the resource abundance variable is significant in specifications R1, R2, and R4, and marginally significant in R5. For the sub-period of 1995–2005, this variable is significantly negative in R1 and R4.

Table 4. Per Capita Consumption Growth and Resource Abundance

	R1	R2	R3	R4	R5	R6
1985–2005						
Initial per capita consumption	–0.013	–0.04	–0.043	–0.064	–0.059	–0.037
	(0.28)	(0.78)	(0.79)	(0.81)	(0.76)	(0.48)
Resource intensity	–0.028	–0.019	–0.01	–0.031	–0.029	
	(3.11)***	(1.79)*	(0.60)	(1.82)*	(1.65)	
Change in terms of trade	0.183	0.164	0.149	0.21	0.197	
	(2.07)**	(1.78)*	(1.67)*	(1.73)*	(1.62)	
Coastal dummy		0.05				
		(1.55)				
Pop ≤ 100 km from coast			0.075			
			(1.50)			
Policy			0.015			
			(0.68)			
Distance to nearest seaport					–0.023	–0.034
					(0.79)	(1.24)
Observations	100	100	100	68	68	68
Adjusted R-squared	0.385	0.392	0.396	0.276	0.272	0.235
Omitting variable test p-value	0.767	0.948	0.655	0.234	0.502	0.101
1995–2005						
Initial per capita consumption	0.027	0.005	–0.036	0.045	0.041	0.053
	(0.55)	(0.09)	(0.57)	(0.65)	(0.61)	(0.72)
Resource intensity	–0.022	–0.017	0.001	–0.032	–0.027	
	(2.27)**	(1.36)	(0.07)	(1.81)*	(1.45)	
Change in terms of trade	0.663	0.619	0.574	0.816	0.784	
	(2.73)***	(2.52)**	(2.60)**	(3.01)***	(2.83)***	
Coastal dummy		0.034				
		(0.93)				
Pop ≤ 100 km from coast			0.117			
			(2.41)**			
Policy			0.024			
			–0.79			
Distance to nearest seaport					–0.045	–0.051
					(2.07)**	(2.51)**
Observations	50	50	50	34	34	34
Adjusted R-squared	0.347	0.344	0.411	0.360	0.400	0.253
Omitting variable test *p*-value	0.335	0.281	0.34	0.787	0.355	0.963

Note: Robust *t* statistics in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%. The year dummies, which are not reported here, are jointly significant in all the specifications.

Table 5. Per Capita Rural Consumption Growth and Resource Abundance

	R1	R2	R3	R4	R5	R6
1985–2005						
Initial per capita rural consumption	–0.09	–0.131	–0.154	–0.19	–0.186	–0.127
	(1.54)	(2.23)**	(2.87)***	(2.03)**	(2.02)**	(1.53)
Resource intensity	–0.036	–0.027	–0.02	–0.038	–0.038	
	(3.25)***	(2.09)**	(1.15)	(1.88)*	(1.84)*	
Change in terms of trade	0.143	0.119	0.104	0.126	0.13	
	(1.63)	(1.30)	(1.17)	(1.02)	(1.03)	
Coastal dummy		0.064				
		(1.88)*				
Pop ≤ 100 km from coast			0.081			
			(1.43)			
Policy			0.022			
			(1.00)			
Distance to nearest seaport					0.008	0.001
					(0.25)	(0.03)
Observations	100	100	100	68	68	68
Adjusted R-squared	0.249	0.264	0.26	0.151	0.138	0.114
Omitting variable test *p*-value	0.205	0.87	0.866	0.19	0.116	0.104
1995–2005						
Initial per capita rural consumption	–0.066	–0.121	–0.238	–0.109	–0.112	–0.037
	(1.24)	(2.10)**	(3.61)***	(1.20)	(1.22)	(0.37)
Resource intensity	–0.039	–0.030	–0.020	–0.047	–0.046	
	(3.33)***	(2.39)**	(1.44)	(2.29)**	(2.25)**	
Change in terms of trade	0.769	0.683	0.728	0.761	0.758	
	(2.88)***	(2.72)***	(3.36)***	(2.54)**	(2.50)**	
Coastal dummy		0.080				
		(2.07)**				
Pop ≤ 100 km from coast			0.159			
			(2.85)***			
Policy			0.065			
			(2.00)*			
Distance to nearest seaport					–0.006	–0.01
					(0.21)	(0.39)
Observations	50	50	50	34	34	34
Adjusted R-squared	0.228	0.274	0.360	0.228	0.201	0.080
Omitting variable test *p*-value	0.155	0.113	0.008	0.044	0.030	0.394

Note: Robust *t* statistics in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%. The year dummies, which are not reported here, are jointly significant in all the specifications.

For the whole sample, when both the geography and policy variables are included, the coefficient for the resource variable becomes nonsignificant due to the inherent multicollinearity among the three variables. When the regression is run on only the inland sample, the magnitude of the negative coefficient is larger than when the whole sample is used. To check if the negative impact of resource abundance on consumption growth is due to the inclusion of the geographic variable in the last equation, we repeat the calculation without the resource intensity variable. The sign and significance level of the coefficient for the geography variable remain largely the same (specifications R5 and R6).

Because most natural resources are produced in remote rural areas, it is interesting to investigate the impact of natural resources on growth in consumption by rural residents. Table 5 lists the results obtained when the same calculations were applied to the growth of per capita rural consumption. The negative coefficient for the resource abundance variable is statistically significant in all the specifications in which it is present, except for R3. A resource boom in rural areas does not necessarily trickle down to the local population and lead to consumption growth. In fact, having abundant resources may be more of a curse than a blessing for rural residents. Comparison of the coefficient for the resource intensity variable in specification R4 in Tables 4 and 5 shows that the negative impact of resource abundance on consumption growth is greater for rural areas than for China as a whole. This finding suggests that rural residents benefit less from positive resource shocks than their urban counterparts, even though they are physically closer to the point of production.

The estimation results in Tables 3–5 indicate that the negative impact of resource abundance is more closely related to per capita consumption growth, in particular rural per capita consumption growth, than to per capita GDP growth. The standard of living of rural residents in resource-rich regions does not grow in tandem with the level of natural resource wealth.

3. THE CHANNELS OF THE RESOURCE CURSE

At least six transmission channels contributing to the resource curse have been put forward (Ross, 1999; Stevens, 2003), namely a long-term decline in terms of trade, revenue volatility, the Dutch disease, weak linkage with other sectors of the economy, rent-seeking behavior, and institutional quality. For a country relying on natural resources as a primary revenue source, a prolonged drop in real prices directly affects economic development. In the period of 1985–2005, the terms of trade in China favored the resource sector, as shown in Figure 1. Thus, worsening terms of trade can be excluded as a contributing factor. Because natural resource prices were fairly stable during this period, we also exclude revenue volatility as an explanation for the observed curse of natural resources on consumption growth.

The last two of the six channels relate to institutions. The institution school (Bulte, Damania, and Deacon, 2005; Mehlum, Moene, and Tovik, 2006) posits that institutional arrangements regarding the distribution of resource rents have the greatest effect on welfare outcomes. The above studies use indicators of the rule of law and government competitiveness as measures of institutional quality. In China, the *de jure* institutional and governance structures are highly homogenous and there are no systematic indicators on government competitiveness (Zhang, 2006). As a consequence, we cannot directly use the method in the literature to directly test whether institutional arrangements in China contribute significantly to the resource curse. Instead, we look in-depth at the institutional arrangements in regard to the distribution of resource rents and examine how such arrangements may affect the outcome variable.

According to the Chinese constitution, all natural resources beneath the ground belong to the state.[11] In the decades between the establishment of the People's Republic of China in 1949 and the enactment of the Natural Resource Law in 1986, SOEs did not provide any compensation to local people for mining natural resources because both the enterprises and resources were owned by the state. The state sector enjoyed exclusive property rights on mining. Following the market reforms since the 1970s, the demand for natural resources went up dramatically. The monopoly mining rights granted to SOEs inhibited the development of this sector. It became imperative to reform the property rights arrangement, allow more private and foreign investment, and increase the supply of natural resources. Although the Mineral Resource Law was passed in 1986, it was not put into full practice until 1994 when the Implementation Regulations on the Mineral Resource Law were introduced.[12] Overall, from 1949 to 1994, SOEs were the dominant players in the mining sector and the accrued rents did not necessarily improve local welfare.

---

[11] A good reference on the evolution of natural resource property rights is Zhang (2000).

[12] The regulations are available at www.mlr.gov.cn/pub/mlr/documents/t20041125_74922.htm.

Under the new regulations, local governments were allowed to auction the development rights of mineral resources to the private sector, including multinational companies. Local governments were also permitted to explore and develop mineral resources. However, under the new regulations, SOEs still enjoyed preferential treatment in developing large mineral reserves. Collective enterprises and private investors were able to explore and develop small-scale reserves left over by the state sector. The Ministry of Land and Natural Resources grants permits for the exploration and mining of large-scale reserves, while provincial and county-level governments are responsible for issuing permits for medium- and small-scale reserves falling within their jurisdictions.

During the late 1980s and early 1990s, China began a fiscal decentralization process (Zhang, 2006). Under the new fiscal arrangements that emerged from this process, local governments have a strong incentive to generate more revenue. Faced with limited and mobile capital, local governments compete vigorously to attract new investment (Cai and Tresman, 2005). In areas with natural resources, selling exploration and mining rights is a quick way to create revenues. As a result, many small-scale mines have been privatized since 1994. However, the process of privatizing natural resources lacks transparency. In the absence of elections and the associated checks and balances, the interests of government officials may not be aligned with the interests of local residents.

When conflicts arise between developers and local residents, the Natural Resource Law stipulates that mediation and resolution are the responsibility of local courts. However, local courts are not independent of local governments, leaving open the possibility of collusion between local courts, local governments and investors. Such collusion allows local governments to meet their objective of generating quick revenues, but may result in the unfair allocation of resource rents. When the price of a natural resource increases, the ambiguous property rights on natural resources may encourage rent-seeking behavior, to the detriment of rural residents, who usually do not have direct voices in the process. Although it is impossible to directly test the impact of institutional quality, useful indirect information on the importance of institutional arrangements governing resource rents can be gleaned by examining the investment and consumption patterns of governments and individuals associated with resource abundance. Given the framework within which resources are governed in China, we test the following two hypotheses:

- *Hypothesis I: The share of investment by the state sector in total investment is positively related to the abundance of natural resources.*
- *Hypothesis II: The ratio of government consumption to private consumption is larger in resource-rich regions.*

To test the first hypothesis, the first regression presented in Table 6 examines the change in the ratio of private capital to SOE capital. As shown by the negative coefficient, the ratio of private capital to

SOE capital grows more slowly in resource-abundant regions than in resource-poor regions. This result supports the first hypothesis that, in resource-rich regions, most investment is made by the state sector. Because investment data with a breakdown by ownership is only available up to 1994/1995, we cannot further examine the change in the composition of private and public capital since the passing of the Implementation Regulations on Natural Resource Law in 1994.

Hirschman (1958) argued that the root cause of slower growth in resource-rich economies is a weak linkage between resource enclaves and the rest of the economy. To test this hypothesis, ideally we should examine the connection between resource abundance and growth of the manufacturing sector. However, no systematic data is available for the manufacturing sector in China. Here we use the ratio of industrial GDP to overall GDP as a proxy measure of manufacturing development. However, this approach has the problem that the industrial GDP includes not only the manufacturing sector, but also the construction and transportation sectors. A resource boom may hurt the manufacturing sector, yet benefit the local construction and transportation sectors. As shown in Table 6, the linkage between resource abundance and industrial sector growth is not significant. Because of the problem inherent in this proxy variable, our results on the linkage between resource abundance and negative manufacturing growth are only suggestive. Future studies with better manufacturing data are called for.

Based on comparative advantage, it is natural for lagging regions to focus on the resource sector. Provided rents are fairly distributed among local residents, governments, and business, the favorable terms of trade in the resource sector should have a trickle-down effect on household consumption. However, the estimation results in Tables 3 and 4 suggest otherwise. The question then arises: to where have the rents from the booming resource sector flowed?

Under the current rule of resource rent allocation, the state sector should distribute rents fairly among local residents. However, if there is rent seeking behavior or if the distribution channels are blocked, local residents may receive a smaller share of the rising resource rents they are entitled to.

In testing the above proposition, we examine the change in the ratio of government to household consumption in the GDP account by expenditure. The positive coefficient for the resource variable suggests that the government benefits more from the natural resource windfall than do local residents. The results thus offer support to hypothesis II.

In the literature, the most commonly discussed channel of the resource curse is the Dutch disease. The Dutch disease model postulates that a resource boom will cause a country's exchange rate to appreciate, which will make exports more expensive in the international market. The increase in the price of exports will, in turn, inhibit the country's growth. In essence, the Dutch disease hypothesis refers to the crowding-out effect on the tradable sector in terms of higher prices. Since there is only one form of currency in China, the transmission channel of price impact of natural resources is not through the standard exchange rate, as occurs in cross-country cases. However, there is still a potential price effect. As argued by Sachs and Warner (1999), positive shocks from natural resources tend to increase demand for non-traded goods, leading to higher overall local prices. This will in turn increase the cost of living and hurt the competitiveness of local businesses that produce tradable goods.

Empirical evidence on the Dutch disease hypothesis based on cross-country data is inconclusive (Auty, 2001). An interesting feature of using provincial data within a country to test the hypothesis is that we do not need to deal with the complications arising from foreign exchange rate regimes. Because China does not publish the non-traded price index at the provincial level, we cannot directly test the impact of resource abundance on the price level of non-tradable goods. However, if we assume that the price level for tradable goods is similar across regions, then a higher non-traded price will be reflected in the general price index. In support of this assumption, transportation improvements and market reform have caused China's domestic market to become increasingly integrated and prices to converge (Bai *et al.*, 2004; Wei and Fan, 2004; Zhang and Tan, 2007). Therefore, the above assumption on the law of one price in the tradable sector appears to be reasonable.

One potential link between resource abundance and negative economic performance is education, as shown in Papyrakis and Gerlaph (2007). Unlike the manufacturing sector, expansion of the resource sector usually does not require a highly skilled labor force, likely leading to underinvestment in human capital. In the next regression, we use the average years of schooling as an outcome variable.[13] The coefficient for the resource intensity variable is negative but nonsignificant. This may reflect the fact that the Chinese government has played a strong role in promoting basic education, even in the planned economic era. In addition, there is a long lag time in investment in human capital. Thus, any effects of underinvestment in human capital due to resource abundance may take decades to manifest.

[13]We also use illiteracy rate as an outcome variable. The results are similar.

Table 6. Channels of the Resource Curse

	Non-SOE/SOE fixed investment	Industrial GDP/GDP	Government/household consumption	Schooling	Price level
Initial value	–0.74	–0.383	0.587	–0.104	–0.029
	(7.65)***	(4.06)***	(7.43)***	(2.99)***	(0.31)
Resource intensity	–0.236	0.019	0.057	–0.001	0.028
	(3.37)***	(1.54)	(2.54)**	(0.36)	(2.06)**
Change in terms of trade	–0.384	–0.025	–0.194	–0.003	0.042
	(1.26)	(0.34)	(1.79)*	(0.10)	(0.71)
Observations	45	68	68	68	68
Adjusted R-squared	0.740	0.598	0.631	0.768	0.859
Omitting variable test *p*-value	0.000	0.842	0.271	0.048	0.013

Note: Robust *t* statistics in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%. Because the breakdown of fixed investment by ownership was not published after 1995, the first regression is limited up to 1995. To obtain one more panel from 1980 to 1985 for the first regression, we assume the total resource output by province in 1985 is the same as that in 1980.

In the last column of Table 6, we regress the change in general retail price level on the historical resource endowment conditional upon the initial price level, akin to specification R4 in Tables 3–5.[14] To remove regional effects, the sample includes only the inland provinces. The results show that areas with more intensive resource exploitation tend to exhibit a more rapid price hike, suggesting the non-traded price in resource intensive regions must have risen faster to offset the decline in the real price of tradable goods incurred through lower transportation costs and a more integrated market.[15] The above-normal price levels in resource-abundant regions may cause businesses in these regions to become less competitive in both the domestic and international markets. In other words, the natural resource sector may crowd out other tradable sectors through the price effect. This finding is consistent with those of Sachs and Warner (2001), and provides evidence that the Dutch disease may occur even within a country.

[14]The finding still holds even after controlling for per capita consumption.

[15]There are numerous news reports in Chinese on rocketing real estate prices in coal mining towns (e.g., www.people.com.cn/GB/news/37454/37461/2992927.html.

4. CONCLUSIONS

Despite increasing market integration and better transport infrastructure, regional inequality has risen significantly in China since economic reforms were initiated. This paper offers an explanation for the observed increase in regional inequality from the perspective of natural resource endowments and the mechanism governing rent allocations. China's booming economy bids up demand for natural resources. In China, natural resources nominally belong to the state, and farmers have no right to a share of the rent. Consequently their welfare has little to do with the booming resource sector. In resource-rich regions, most resource rents go to the government and SOEs, crowding out private capital accumulation. Greater revenues from a positive resource shock tend to boost government consumption more than household consumption. In short, the root of the problem lies in the rules governing resource rent allocations.

Another contribution of this paper is that it performs empirical testing of the resource curse hypothesis within a country. In contrast to the present work, the majority of the large body of empirical literature on the resource curse hypothesis uses cross-country data. The identification problem inherent in a cross-sectional data set makes it a daunting task to empirically test the resource curse hypothesis. Using panel data at the provincial level in China and estimating the sample only for inland regions, this paper distinguishes geographic effects from resource effects, thereby revealing the existence of a resource curse in terms of per capita consumption growth. The present results provide only weak support for a direct link between resources and GDP growth. Our findings indicate that, to a large extent, growth dividends do not trickle down to rural residents in resource-abundant regions. Since many of the poor live in regions rich in natural resources, the existence of a resource curse may help explain the recent widening regional inequality and stagnant poverty prevalent in resource-rich regions, in particular western China.

The negative linkage between natural resource abundance and consumption growth suggests that the institutional roots of rural poverty may be deeper than previously thought. To eliminate poverty and reduce inequality in rural areas, it is critical to reform the property rights arrangements regarding natural resources. In the absence of such reform, it will be difficult to increase the income of the poor and to reduce the income gap by relying primarily on fiscal transfers.

Even in the absence of the foreign exchange rate effect that forms the basis of the traditional Dutch disease hypothesis, a resource curse can still occur through the channel of non-traded price. Resource booms tend to boost non-traded prices and raise the cost of living in resource-rich regions. This hurts the competitiveness of manufacturing sectors.

With globalization, both factor and product markets become more integrated worldwide. The rise of emerging economies such as China and India means that demand for natural resources will likely continue to increase in the near future. Given that resource exports are the major revenue source of many severely indebted poor countries, it is important to understand the sources of the resource curse and turn resources into a blessing for all. Insights from Chinese provinces may assist in resolving similar problems affecting other poor but resource-rich countries.

APPENDIX

Consumption: The per capita consumption data (at the provincial level) from 1952 to 1998 come from *Comprehensive Statistical Data and Materials on 50 Years of New China* (CNBS 1999), while consumption data for later years are from various issues of the *China Statistical Yearbook*. The consumption expenditures are comparable across years. For details on the construction of the data series, see Kanbur and Zhang (2005, Data Appendix).

GDP: The real GDP growth rates, nominal GDP, household consumption, and government consumption prior to 1996 come from *Data of Gross Domestic Product of China: 1952–1995* (CNBS) while the data for the period 1996–2002 are from *Gross Domestic Product of China: 1996–2002* (CNBS). Data for the later years are from *China Statistical Yearbook* Using the GDP in 1985 as a base, we calculate the real GDP for the whole period using the comparable GDP growth rates.

Geography and policy variables: The share of population within 100 kilometers of coastline and the policy variables are obtained from Démurger *et al.* (2001). The distance to the nearest seaport variable is from Bao *et al.* (2002).

Population: Population data were used as weights in the calculation of the inequality measures. Data on total and rural population for 1985–1998 come from *Comprehensive Agricultural Statistical Data and Materials on 50 Years of New China* (CNBS 2000), and those for 1999 onwards come from *China Statistical Yearbook* and *China Agricultural Statistical Yearbook* (CNBS 1999–2005).

Rural poverty: The rural poverty data are from Ravallion and Chen (2007).

Resources: The data for coal, hydroelectric power, oil, and natural gas are from various issues of the *China Energy Yearbook*. They are converted into standard coal using the technical conversion coefficient provided at the end of the yearbook.

Terms of trade: The terms of trade for the resource sector are defined as the ratio of fuel price index to the overall consumer price index. The general consumer price index for 1985–1998 is from *Comprehensive Statistical Data and Materials on 50 Years of New China* (CNBS 1999) and for 1999 onwards is from the *China Statistical Yearbook*. The fuel price index is from various issues of the *China Statistical Yearbook*. Because the fuel price index is not available at the provincial level prior to 1985, we use the national fuel price index as a proxy for each province. Considering that the fuel prices were largely under control of the planned economy in the early 1980s, the use of a national-level price index should have minimal impact on the results.

Rural education. We use the percentage of rural population with different education levels to calculate the average years of schooling, assuming 0 years for a person who is illiterate or semi-illiterate, 5 years for primary-school education, 8 years for a junior high-school education, 12 years for a high-school education, 13 years for a professional school education, and 16 years for a college education. The data are from population censuses and *China Rural Statistical Yearbook*.

REFERENCES

Auty, Richard, 2001. *Resource Abundance and Economic Development*, Oxford: Oxford University Press.

Bai, Chong-En, Yingjuan Duan, Zhigang Tao, and Sarah T. Tong, 2004. "Local Protectionism and Regional Specialization: Evidence from China's Industries," *Journal of International Economics*, 63(2): 397-417.

Bao, Shuming, Gene Chang, Jeffrey D. Sachs, and Wing Thye Woo, 2002. "Geographic Factors and China's Regional Development under Market Reforms, 1978-98," *China Economic Review*, 13: 89-111.

Bulte, Erwin H., Richard Damania, and Robert T. Deacon, 2005. "Resource Intensity, Institutions, and Development," *World Development*, 33 (7): 102-91044.

Cai, Hongbin and Daniel Tresman, 2005. "Does Competition for Capital Discipline Governments? Decentralization, Globalization, and Public Policy," *American Economic Review*, 95 (3): 817-830.

Chen, Yueming and Xiao-an Zeng, 1997. "An Overview and Output on China's Energy Price Reform (Zhongguo Nengyuan Jiage Gange Huigu yu Zhanwang)," *Coal Research* (*Meitan Jingji Yanjiu*), 6: 5-9. [in Chinese]

China National Bureau of Statistics (CNBS), various years. *China Energy Statistical Yearbook*. Beijing: China Statistics Press.

China National Bureau of Statistics (CNBS), various years. *China Rural Statistical Yearbook*. Beijing: China Statistics Press.

China National Bureau of Statistics (CNBS), various years. *China Statistical Yearbook*. Beijing: China Statistics Press.

China National Bureau of Statistics (CNBS), 1999. *Comprehensive Statistical Data and Materials on 50 Years of New China*, Beijing: China Statistics Press.

China National Bureau of Statistics (CNBS), 2004. *Data of Gross Domestic Product of China: 1956-2002*. Beijing: China Statistics Press.

China National Bureau of Statistics (CNBS), 1997. *The Gross Domestic Product of China: 1952-1995*. Dalian: Dongbei University of Finance and Economics Press.

Démurger, Sylvie, Jeffrey D. Sachs, Wing Thye Woo, Shuming Bao, 2002. "Geography, Economic Policy, and Regional Development in China," *Asian Economic Papers*, 1 (1): 146-197.

Fan, Shenggen and Connie Chan-Kang, 2005. *Road Development, Economic Growth, and Poverty Reduction in China*, International Food Policy Research (IFPRI) Report No. 138. Washington: IFPRI.

Fan, Shenggen, Linxiu Zhang, and Xiaobo Zhang, 2004. "Reform, Investment and Poverty in Rural China," *Economic Development and Cultural Change*, 52 (2): 395-422.

Hirschman, Albert O.,1958. *The Strategy of Economic Development*, New Heaven CT: Yale University Press.

Hu, Dapeng, 2002. "Trade, Rural-Urban Migration, and Regional Income Disparity in Developing Countries: A Spatial General Equilibrium Model Inspired by the Case of China," *Regional Science and Urban Economics*, 32: 311-338.

Kanbur, Ravi and Xiaobo Zhang, 1999. "Which Regional Inequality: Rural-Urban or Coast-Inland? An Application to China," *Journal of Comparative Economics* 27: 686-701.

Kanbur, Ravi and Xiaobo Zhang, 2005. "Fifty Years of Regional Inequality in China: A Journey Through Central Planning, Reform and Openness," *Review of Development Economics* 9(1): 87-106.

Mehlum, Halvor, Karl Moene, and Ragnar Torvik, 2006, "Institutions and Resource Curse," *Economic Journal*, 116: 1-20.

Papyrakis, Elissaios, and Reyer Gerlagh, 2007. "Resource Abundance and Economic Growth in the United States," *European Economic Review*, 51 (4): 1011-1039.

Ravallion, Martin and Shaohua Chen, 2007. "China's (Uneven) Progress against Poverty," *Journal of Development Economics*, 82 (1): 1-42.

Ross, Michael, 1999. "The Political Economy of the Resource Curse," *World Politics*, 51 (2): 297-322.

Sachs, Jeffrey and Andrew M. Warner, 1999. "The Big Push, Natural Resource Booms and Growth," *Journal of Development Economics*, 59: 43-76.

Sachs, Jeffrey and Andrew M. Warner, 2001. "Natural Resources and Economic Development: The Curse of Natural Resources," *European Economics Review*, 45: 827-838.

Stevens, Paul, 2003. "Resource Impact: Curse or Blessing: A Literature Survey," *Journal of Energy Literature*, 9 (1): 1-42.

Xu, Kangning and Jian Wang, 2006. "An Empirical Study of a Linkage Between Natural Resource Abundance and Economic Development" (*Ziran Ziyuan Fengyu Chengdu yu Jingji Fazhang Shuiping de Guanxi*), *Economic Research* (*Jingji Yanjiu*), 1: 78-89. (in Chinese)

Wei, Xiangdong, and C. Simon Fan, 2004. "Converge to the Law of One Price in China," paper presented the Allied Social Sciences annual meetings at San Diego, January 3-5.

Zhang, Xiaobo, 2006. "Fiscal Decentralization and Political Centralization in China: Implications for Growth and Regional Inequality," *Journal of Comparative Economics*, 34 (4): 713-726.

Zhang, Xiaobo and Kong Yam Tan, 2007. "Incremental Reform and Distortions in China's Product and Factor Markets," *World Bank Economic Review*, 21(2): 279-299, 2007.

Zhang, Wenju, 2000. "Evolution and Development Orientation of Property Rights System of Mineral Resources in China (Woguo Kuangchan Ziyuan Caichan Quanli Zhidu de Yanhua he Fazhang Fangxiang)," *China Geology and Mining Economics* (Zhongguo Dizhi Kuangchan Jingji), 1: 1-10.

RECENT IFPRI DISCUSSION PAPERS

For earlier discussion papers, please go to www.ifpri.org/pubs/pubs.htm#dp. All discussion papers can be downloaded free of charge.

712. *Is Food Insecurity More Severe in South Asia or Sub-Saharan Africa?: A Comparative Analysis Using Household Expenditure Survey Data*. Lisa C. Smith and Doris Wiesmann, 2007.

711. *Managing Conflict Over Natural Resources in Greater Kordofan, Sudan: Some Recurrent Patterns and Governance Implications.* El Fatih Ali Siddig, Khalid El-Harizi, and Betinna Prato, 2007.

710. *Mortality, Mobility, and Schooling Outcomes Among Orphans: Evidence from Malawi.* Mika Ueyama, 2007.

709. *Agricultural Technology Choices for Poor Farmers in Less-Favored Areas of South and East Asia*. John Pender, 2007.

708. *Sharing Science, Building Bridges, and Enhancing Impact: Public Private Partnerships in the CGIAR*. David J. Spielman, Frank Hartwich, and Klaus von Grebmer, 2007.

707. *Policies to Promote Cereal Intensification in Ethiopia: A Review of Evidence and Experience.* Derek Byerlee, David J. Spielman, Dawit Alemu, and Madhur Gautam, 2007.

706. *Sistemas de Innovación Piscícola en la Amazonia Boliviana: Efectos de la Interacción Social y de las Capacidades de Absorción de los Pequeños Agricultores*. Frank Hartwich, Vicente Eguez Camacho, Mario Monge, y Luis Ampuero Ramos, 2007.

705. *The Role of Clustering in Rural Industrialization:A Case Study of the Footwear Industry in Wenzhou.* Zuhui Huang, Xiaobo Zhang, and Yunwei Zhu, 2007.

704. *The Economics of GM Food Labels: An Evaluation of Mandatory Labeling Proposals in India.* Sangeeta Bansal, Bharat Ramaswami, 2007.

703. *The Power Mapping Tool: A Method for the Empirical Research of Power Relations*. Eva Schiffer, 2007.

702. *The Bang for the Birr: Public Expenditures and Rural Welfare in Ethiopia.* Tewodaj Mogues, Gezahegn Ayele, and Zelekawork Paulos, 2007.

701. *Public Spending and Poverty Reduction in an Oil-Based Economy: The Case of Yemen.* Mohamed A. Chemingui, 2007.

700. *Integrated Management of the Blue Nile Basin in Ethiopia: Hydropower and Irrigation Modeling*. Paul J. Block, 2007.

699. *Building Public-Private Partnerships for Agricultural Innovation in Latin America.* Suresh Babu, Maria Veronica Gottret, Frank Hartwich, and Jaime Tola, 2007.

698. *Cost Implications of Agricultural Land Degradation in Ghana: An Economywide, Multimarket Model Assessment.* Xinshen Diao and Daniel B. Sarpong, 2007.

697. *Is HIV/AIDS Undermining Botswana's 'Success Story'? Implications for Development Strategy.* James Thurlow, 2007.

696. *Supermarket Purchases and the Dietary Patterns of Households in Guatemala.* Abay Asfaw, 2007.

695. *Agricultural Growth Linkages in Ethiopia: Estimates using Fixed and Flexible Price Models*. Xinshen Diao, Belay Fekadu, Steven Haggblade, Alemayebu Seyoum Teffesse, Kessu Wamisbo, and Bingxin Yu, 2007.

694. *Is the Relationship Between Aid and Economic Growth Nonlinear?*. Andros Kourtellos, Chih Ming Tan, and Xiaobo Zhang, 2007.

693. *Regional Disparities in Ghana: Policy Options and Public Investment Implications*. Ramatu M. Al-Hassan and Xinshen Diao, 2007.

692. *Innovación en el Cultivo del Maní en Bolivia: Efectos de la Interacción Social y de las Capacidades de Absorción de los Pequeños Productores*. Frank Hartwich, Tito Arispe, y Mario Monge. 2007.

691. *Marriage, Schooling, and Excess Mortality in Prime-Age Adults: Evidence from South Africa*. Futoshi Yamauchi, 2007.

690. *Renegotiating the Food Aid Convention: Background, Context, and Issues*. John Hoddinott and Marc J. Cohen, 2007.

689. *Agricultural Growth and Investment Options for Poverty Reduction in Rwanda*. Xinshen Diao, Shenggen Fan, Sam Kanyarukiga, and Bingxin Yu, 2007.

INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

www.ifpri.org

IFPRI HEADQUARTERS

2033 K Street, NW
Washington, DC 20006-1002 USA
Tel.: +1-202-862-5600
Fax: +1-202-467-4439
Email: ifpri@cgiar.org

IFPRI ADDIS ABABA

P. O. Box 5689
Addis Ababa, Ethiopia
Tel.: +251 11 6463215
Fax: +251 11 6462927
Email: ifpri-addisababa@cgiar.org

IFPRI NEW DELHI

CG Block, NASC Complex, PUSA
New Delhi 110-012 India
Tel.: 91 11 2584-6565
Fax: 91 11 2584-8008 / 2584-6572
Email: ifpri-newdelhi@cgiar.org