How Does Public Spending Affect Growth and Poverty in China?

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I. Introduction

During the past two decades, there has not been much progress in reducing the total number of poor in the developing world except in China (Chen and Ravallion, 2000), where the number of the poor declined from 260 million in 1978 to 50 million in 1997.[1] A reduction in poverty of this scale within such a short period of time has never occurred before in the history of the world. What are the major causes behind the rapid poverty reduction? What lessons does China's experience provide for tackling the still enormous poverty problem in many of the developing countries?

The literature on Chinese agricultural growth and rural poverty reduction is extensive (McMillian et al. (1989), Fan (1990), Fan (1991), Lin (1992), Zhang and Carter (1997), and Fan and Pardey (1997)). Most of these studies attributed the success to institutional changes and policy reform since the late 1970s, largely ignoring many other important factors such as public investment.[2] As recognized by the new growth theory (Barro, 1990), public spending is an important factor for self-sustaining productivity gains and long-term growth. In China's case, prior to the reforms, the effects of government investment were in large restrained by many policy and institutional barriers. The reforms have reduced these barriers, making it possible for these investments to generate enormous effects on economic growth and poverty reduction.

Government expenditure has not only contributed to agricultural growth and hence indirectly to poverty alleviation, but it has directly created rural nonfarm jobs and increased wages. The real significance of government development expenditure lies in the fact that it impacts a greater amount of "trickle-down" benefits for the poor in the growth process than agricultural growth alone. Unlike agricultural growth, which often reduces poverty only by increasing mean consumption, government expenditure reduces poverty by increasing both mean income and improving the distribution of income. Despite the importance, little attention has previously been paid to the role of government spending in alleviating poverty.[3]

The purpose of this study is to investigate the causes of the decline in rural poverty in China, and in particular to examine how various instruments of public investment influence both growth and poverty by controlling for the effect of institutional change. We seek to quantify the effectiveness of different types of government expenditures in contribu-

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[1] The number of the rural poor each year was reported by various issues of China Agricultural Development Report, a white paper of the Ministry of Agriculture. The poverty line is defined as the level below which income and food production are not sufficient to meet subsistence levels of food intake, shelter and clothing. By this standard, there are virtually no urban poor. However, there are very large numbers of near poor —i.e., those people with levels of income and food production slightly greater than subsistence needs —in rural and, increasingly, urban China (Piazza and Liang 1998).

[2] Fan and Pardey (1997) were the first to point out that omitted variables such as R&D investment would bias the estimate of the sources of production growth. They found that, by ignoring the R&D variable in the production function estimation, the effects of institutional change would be overestimated to a large extent. In addition to R&D investment, government investments in roads, electrification, education, and other public investment in rural areas have also contributed to the rapid growth in agricultural production. Omitting these variables will bias the estimates of the production function for Chinese agriculture as well.

[3] In spite of the extraordinary success in the poverty reduction in rural China, there have been few studies on the causes of this success. These studies include World Bank, 1992; Jalan and Ravallion, 1996; Jalan and Ravallion, 1997; Chen and Ravallion, 1996; Gustafsson and Li, 1998; Khan, 1997; and Rozelle et al., 1998. However, most of these studies have focused on the measures of rural poverty and its changes. The determinants of poverty reductions, however, have in large been ignored.

ting to poverty alleviation. Such information can assist policy makers in targeting their investments more effectively to reduce poverty in the future. More efficient targeting has become increasingly important in an era of macroeconomic reforms in which the government faces a more stringent budget constraint.

Using provincial level data for 1970 - 1997, this study estimates a system equations model that permits calculation of the number of poor people raised above the poverty line for each additional yuan spent on different expenditure items. The model also enables us to identify the channels and the impacts of different types of government expenditures on poverty alleviation. For instance, increased government investment in roads and education may reduce rural poverty not only through improved agricultural production, but also through improved employment opportunities in the non-farm sector. Understanding these different effects of different types of public spending can provide useful policy insights for the government to improve the effectiveness of its poverty alleviation strategy.

Many previous studies on poverty have usually looked at growth and poverty separately. Yet the key piece of information from the policy makers' standpoint is how different polices affects both growth and poverty. In this model, we are able to examine both the growth and poverty effects of different types of government expenditures. In addition, the model enables us to calculate growth and poverty reduction effects from the regional dimension. These regional differences provide important information on how the government can target its limited resources by region in order to achieve more equitable regional development, a key objective debated in both academic and policy-making circles in China.

The paper is organized as follows. The next section reviews changes in poverty and public investment in rural China in recent decades. This is followed by sections briefly describing our conceptual framework and model, and the empirical results. We summarize our findings in the concluding section.

II. Poverty Changes and Public Investments

1. Rural income, inequality, and poverty

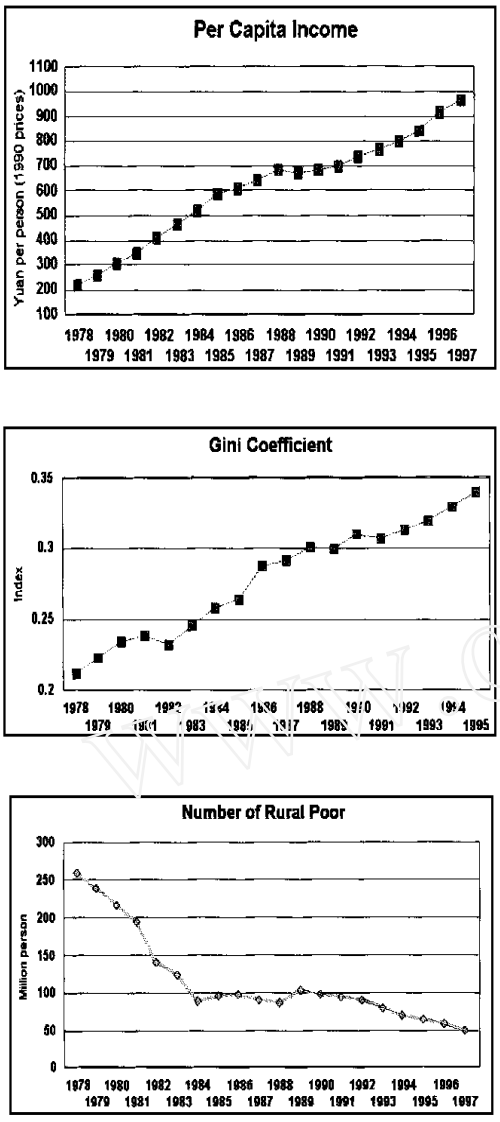
Per capita income in rural China was extremely low prior to the rural reforms begun in 1978. In 1978, the average income per rural resident was only about 220 yuan per year, or about 150 US$ dollars (Figure 1).[4] During the 29 years from 1949 to 1978, per capita income increased by only 95 percent, or 2.3 percent per annum. China was one of the poorest countries in the world. The majority of rural people were struggling with day-to-day survival. In 1978, 260 million residents in rural China, or 33 percent of the total rural population, lived under the poverty line, and had inadequate food and income to maintain a healthy and productive life.

But this changed dramatically after the rural reforms began. Immediately after the reform, farmers' income soared. Per capita income increased to 640 yuan in 1984, an annual growth rate over the period 1978 - 1984 of 15 percent per annum. The income gains were shared widely enough to cut the number of rural poor, hence the rate of rural poverty, by more than half. By 1984, only 11 percent of the rural population lived under the poverty line. Meanwhile, income inequality, measured as the Gini Coefficient, increased only slightly.

During the second phase of reforms in 1985 - 1989, rural income continued to increase, but at a much slower pace of 3 percent per annum. This was mainly due to the stagnation of agricultural production. As a result, there was no further reduction in rural poverty during this period, and the distribution of rural income also became less egalitarian (the Gini Coefficient index rose from 0.26 to 0.30). The deterioration in the income distribution probably resulted from the changed nature of income gains. With crop prices stagnant and input prices rising, income gains had to come from increased efficiency in agricultural production and marketing or from nonfarm employment. Although the poor increased their access to modern inputs, their generally adverse production conditions constrained their gains. Moreover, increases in nonfarm income also contributed to a worsening income distribution, because the gains were mostly concentrated in the coastal areas where per capita income was already high and the incidence of poverty was much lower than elsewhere. The large areas in the west

[4] Total and per capita incomes are all measured at constant 1990 prices in this report.

Figure 1. Income, Inequality, and Poverty Change in Rural China



and border provinces, where the majority of the rural poor reside, lagged far behind. As a result, the number of the poor increased from 89 million in 1984 to 103 million in 1989, a net increase of 14 million in 5 years.

It was not until 1990 that rural poverty began to decline again. The number of rural poor dropped from 103 million in 1989 to 50 million in 1997, a reduction of 9 percent per annum. The rate of rural poverty reduction was more rapid than income growth (5 percent per annum during the same period), suggesting that the strengthened government's anti-poverty programs might be effective.

In terms of regional distribution, more than 60 percent of the rural poor in 1996 lived in border provinces such as Gansu, Yunan, Sichuan, Guizhou, Guangxi, Qinghai, Ningxia, Inner Mongolia, and Xinjiang. Given the low population density in these areas, the poverty incidence is much higher than the national average. For example, 23 percent of the rural population in Gansu, and 27 percent in Xinjiang were under the poverty line in 1996. Another pocket of poverty concentration is in the Northern China Plain where the poor account for 22 percent of the national total. This area includes Henan, Hebei, Shannxi, and Shanxi where poor natural resources, particularly poor soil and lack of water resources, are the major reasons for the high concentration of rural poor.

2. Technology, infrastructure, and public investment

In addition to institutional change mentioned above, rapid development in technology and infrastructure has also contributed to agricultural production growth, which in turn provided adequate food supplies for an increasing and richer population and prompted the development of the rural nonfarm sector. The latter has become increasingly important for poverty reduction in rural areas but has in large been ignored in the literature. In this section, we review the development of R&D, irrigation, education, and infrastructure, the four important factors for long-term growth.

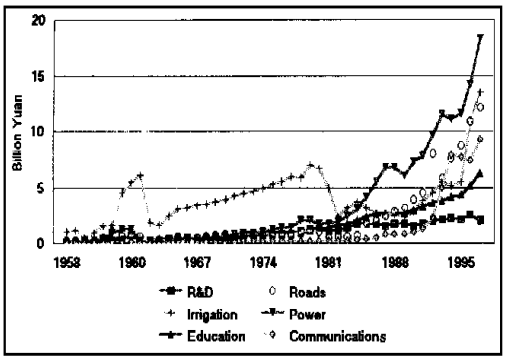
R&D China's agricultural research system expanded rapidly during the past four decades and is now one of the largest public systems in the world. It employs more than 60,000 senior scientists and, in 1997, spent 2.7 billion yuan (at 1990 prices) on research conducted at national, provincial, and prefectural research institutes and agricultural universities.[5] In the early 1990s, the Chinese system accounted for over 40 percent of the less-developed world's agricultural researchers and 35 percent of its total research expenditure.[6]

[5]In 1997, research expenditure in the Chinese agricultural research system (including research expenses by agricultural universities) were 2.7 billion in current Chinese yuan. This is equivalent to US$ 330 million measured by nominal exchange rate, and US$ 1.4 billion measured by 1997 purchasing power parity (Fan, 2000).

[6]Pardey, Roseboom, and Fan (1998).

However, the Chinese agricultural research system has experienced many ups and downs over recent decades. Right after the foundation of the new China in 1949, China's investment in agricultural research was minimal, but it grew rapidly until 1960 (Figure 2). The growth in the 1960s was relatively small due to a three-year natural disaster (1959 - 1961) and the Cultural Revolution (1966 - 1976). Investment increased steadily during the 1970s, but this growth slowed down during the 1980s, and grew only by 23 percent during the entire ten-year period. In the 1990s, agricultural research expenditure began to rise again, largely due to government efforts at boosting grain production through science and technology.

Figure 2. Public Investment in Rural China



Irrigation Due to concentrated rainfall during the monsoon, China's early civilizations developed agricultural systems that were dependent on water conservation and irrigation. The greatest expansion of irrigation facilities took place between 1949 and 1977, when the irrigated area increased from 16 million to 45 million hectares (Table 1). About 70 percent of grains as well as most of the cotton and other cash crops are produced on irrigated land. Many Chinese rivers are tapped for irrigation, with the Yangtze and the Yellow Rivers supplying much of the country's irrigation water through a system of dams and reservoirs that also function as flood control units. Annual usable supplies in the two river basins have doubled, and in some cases tripled since 1949, as the result of an ambitious program of dam construction. The northern and northwestern provinces of China make extensive use of groundwater resources. By 1997, 84,937 reservoirs, with a storage capacity of over 458 billion cubic meters, had been constructed.[7]

In terms of public investment, the government assigned top priority to irrigation immediately after 1949. In 1953, the government spent 1 billion yuan on irrigation investment, 60 times larger than the amount spent on agricultural research (Figure 2). Investments in irrigation continued to increase until 1966. Under the commune system, it was rather easy for the government to mobilize large numbers of rural laborers to undertake large irrigation projects. As a result of this increased investment, more than 10 million hectares of land was brought under irrigation. However, there was little additional investment between 1976 and 1995. In fact, investment declined from 1976 to 1989. In 1989, irrigation investment was only 44 percent of that in 1976. During this period, there was no increase in the irrigated area in Chinese agricultural production. In response to the grain shortfall and large imports in 1995, the government sharply increased investment in irrigation in 1996 and 1997. But further expansion is difficult because of competing industrial and residential uses of water, and declining land areas with irrigation potential. As a result, the returns to investment in irrigation may decline in the future.

Education The education level of the Chinese population was one of the lowest in the world four decades ago. In 1956, less than one-half of primary and secondary aged children attended school. The periods of the Great Leap Forward (1958 - 1961) and the subsequent Cultural Revolution (1966 - 1976) were very disruptive times for Chinese society in general and its education in particular. The educational infrastructure was decimated as a result of the revolutionary struggles, and students suffered because of a vastly watered-down or non-existent curricula. Perhaps the only gain (again at the expense of quality) was the delivery of elementary education to an unprecedented percentage of school-aged children, largely because agricultural collectivization allowed for the creation of large numbers of "commune schools," overseen

[7] Information in this paragraph was summarized from the annual Water and Power Yearbooks (Water and Power Publishing House, Beijing).

directly by the collectives rather than by higher-level agencies. The enrollment rate of school-aged chil dren rose from 43 percent to 97 percent by 1976. In 1983, more than 90 percent of all rural children were enrolled in school, only slightly lower than the urban rate of 98 percent. Since 1978, China has adopted an education policy of "nine-year compulsory schooling system", which requires all children to attend school for at least nine years to finish both primary and junior middle-school programs.

As a result of these efforts, the illiteracy rate of the adult population (15 years and older) dropped from 48 percent in 1970 to less than 10 percent in 1997. Consequently, labor quality has improved substantially, with a decline in the illiteracy rate of agricultural laborers from 28 percent in 1985 to 10 percent in 1997. This improved human capital in rural areas provided a great opportunity for farmers to use modern farming technology, and to engage in nonfarm activities in both rural township enterprises and urban industrial centers.

In terms of expenditure, the government has spent about 2 percent of total national GDP on education, which is much lower than many developed countries, but higher than many developing countries. However, the total expenditure on education is much higher, because rural education is also largely supported by rural communities, and their expenses on education are not counted in the formal government budget.

Despite extraordinary success in basic education in China, many poor have not been reached by the government's efforts. Official statistics show that among the poorer half of the townships in 35 counties supported under a World Bank project in Yunan, Guizhou, and Guangxi, the average enrollment rate was at least 10 percentage points lower than the national average for the same age group (Piazza and Liang, 1998). Special household surveys even documented greater disparities at the village level. The State Statistics Bureau's (SSB's) 1994 survey of 600 households in the poorest townships of these 35 counties showed that the average enrollment rate for children aged 6 to 12 was only 55 percent. It is not surprising that official statistics in these counties also indicate the average literacy rate for the total population as high as 35 percent (Piazza and Liang, 1998).

Overall, most people in China have had access to basic education. Comparing to many developing countries, the provision of basic education in China has been rather broad based. The relatively high literate level may be an important factor behind the rapid agricultural growth and poverty reduction over the past two decades.

Infrastructure Development of rural infrastructure is key to rural social and economic development. But for the past several decades, the government has not paid much attention to the construction of rural infrastructure (Figure 2). Not until recently, did the government realize the important role of rural infrastructure in promoting agricultural production, rural nonfarm employment, and the living standard of the rural population.

Among all transportation facilities, roads are the most crucial to rural development. However, the mountainous topography in many parts of China has hindered the development of roads. In 1953, the total length of roads in China was only about 137 thousand kilometers, and the road density was about 14 kilometers per thousand square kilometers, much lower than India's road density at the time.[8] Moreover, government investment in road construction increased very little from 1953 to 1976 (Figure 2). Nevertheless, the length of roads has increased gradually. Since 1985, the government has increased its investment in roads, particularly high-quality roads such as highways connecting major industrial centers in coastal areas. Rural roads, usually of lower quality, account for about 70 percent of total road length.

Despite great efforts made by the government for the past decade, road density in China is still low by international standards. By 1997, the average road density had reached 127 kilometers per thousand square kilometers, but this was only 26 percent of the density in India (Fan, Hazell, and Thorat 1999).

In contrast to road development, one of the greatest achievements in rural China has been the rapid electrification of villages during the past several decades. The introduction of electricity often profoundly affects village life. Electric lighting expands the productive and

[8] India's road density was 129 kilometers per thousand square kilometers in 1950.

social hours in the day. Radios and television provide accessible, affordable entertainment and education. Power machinery can raise productivity and improve working conditions. Most important, electrification brings with it expectations for progress and a better future.

For the past several decades, China has given higher priority to electrification than to road development in its investment portfolio (Figure 2). Investment in power has increased 90 fold since 1953. Electricity consumption in rural areas increased from almost zero to 198 billion KW in 1997. The most rapid growth occurred in the 1970s and 1980s. The percentage of villages with access to electricity was 97 percent in 1996, and more than 95 percent of households had an electricity connection that year. This percentage was much higher than that of India in the same year.

Prior to 1980, growth in government investment in telecommunications was very slow (Figure 2), increasing from 166 million yuan in 1953 to only 738 million yuan in 1980. However, there has been explosive development in recent years, and the number of rural telephone sets increased from 3.4 million in 1992 to 17.8 million in 1997. This is the result of both public and private investments in the sector: from 1989 to 1996, public investment alone increased more than 10 fold.

3. Production and productivity growth

Policy and institutional changes, along with increased government investments in agricultural research, irrigation, and infrastructure, have markedly influenced growth in production and productivity in Chinese agriculture. Table 1 presents various estimates of production and productivity growth.[9]

Table 1. Agricultural Production and Productivity Growth

Year	Production	Land productivity	Labor productivity	Total factor productivity
Annual growth rates (%)				
1952 - 1977	2.10	1.87	0.12	- 0.42
1978 - 1984	6.63	7.37	5.07	4.72
1985 - 1989	3.17	2.64	1.39	0.95
1990 - 1995	6.89	6.64	7.50	5.85
1952 - 1995	3.72	3.57	2.22	1.50

Source: Fan (1997).

During the pre-reform period of 1952 - 1979, production growth was slow at 2.1 percent per annum, slightly higher than the population growth rate during the same period. There was virtually no gain in labor productivity, and total factor productivity deteriorated by 0.42 percent per annum due to inefficiencies in the production system and misallocation of resources among production activities.

As a result of the poor performance of the agricultural sector for more than two decades, the central government decided to reform the rural sector in 1978. During the initial stage of the reforms, state procurement prices of agricultural products were raised and rural markets were reopened for farmers to trade their produce from their private plots. After two years of experiments, the government began in 1981 to decentralize agricultural production from the commune system to individual farm households. By 1984, more than 99 percent of the production units had adopted the household production responsibility system (MOA, 1998).

Not surprisingly, both technical efficiency (from the decentralization of the production system) and allocative efficiency (from price and marketing reforms) increased significantly during this first stage of reforms. Production increased by more than 6.6 percent and productivity by 5.1 percent per annum.

The second phase of reforms undertaken in 1985 - 1989 was designed primarily to further liberalize the country's agricultural pricing and marketing systems. However, a high rate of inflation increased agricultural production costs, while the government cut the marginal (above-quota) procurement price for grain in 1985. The overall agricultural purchase price index stayed only slightly ahead of overall inflation in subsequent years, reflecting an end to the productivity gains of the previous seven years.[10] Annual production growth was only about three percent, half of the annual rate achieved during the first phase of the reforms. Total factor productivity grew less than one percent per year, less than a quarter of the rate during the previous period.

The 1990s marked a new development stage in Chinese agriculture. The government

[9] For more details about the methodology and data sources of production and productivity measures, refer to Fan (1997).

[10] The rising cost of production was reported by the Ministry of Agriculture (various years), Production Cost Survey.

Table 2. Development of the Rural Nonfarm Sector

Year	Employment	Employment in total rural labouring population	Rural nonfarm GDP	Rural nonfarm GDP as percentage of national GDP	Rural nonfarm wage
	Thousand	%	Index	%	1990 Yuan
1978	2,243	7	100	4.0	640
1980	1,956	6	133	4.3	763
1985	6,715	18	370	6.7	1,141
1990	8,673	21	938	10.4	1,322
1995	12,708	28	4,662	25.5	2,001
1997	13,527	29	6,007	28.2	2,286
Annual growth rate (%)					
1978 - 1985	16.96		20.56	7..56	8.61
1985 - 1990	5.25		20.44	9.27	2.99
1990 - 1997	6.56		30.38	15.30	8.14
1978 - 1997	9.92		24.05	10.81	6.93

continued to implement the market and price reforms, by further reducing the number of commodities under the government's procurement system. The number of commodities subject to government procurement programs declined from 38 in 1985 to only 9 in 1991. In 1993, the grain market was further liberalized and the grain rationing system that had been in existence for 40 years was abolished. In 1993, more than 90 percent of all agricultural produce was sold at market prices, a graphic indication of the degree to which agriculture in China has been transformed from a command and control to a largely free-market sector. It is expected that farmers' allocative efficiency improved substantially during this period of reforms. As a result, agricultural production and productivity continued to rise rapidly with growth rates of 5.6 percent and 3.9 percent per annum respectively (although lower than those during the first phase of the reforms). In 1994, procure ment prices for grains increased by 40 percent. They increased again by 42 percent in 1996. Chinese agriculture has now entered a new stage; one in which the sector is subsidized rather than taxed.[11]

4. Nonfarm employment and wages

One of the most dramatic changes in rural China in recent years has been the rapid increase of rural nonfarm enterprises. Employment in the nonfarm sector as a percentage of total rural employment grew from 7 percent in 1978 to 29 percent in 1997 (Table 2). In 1997, rural enterprises accounted for more than a quarter of national GDP, up from nearly zero even as late as 1978. In 1997, the GDP produced by rural industry in China was larger than the GDP of the entire industrial sector of India.[12] Without the development of the rural nonfarm sector, the annual GDP growth rate from 1978 to 1995 would have been 2.4 percentage points lower per annum.

The rapid development of the rural nonfarm sector not only contributed to rapid national GDP growth, but also raised the average per capita income of rural residents. In 1997, more than 36 percent of rural income was obtained from rural nonfarm activities (SSB 1998).

The success of the rural nonfarm economy had far-reaching impacts on China's economy. In addition to employment and income growth in rural areas, the rapid development of rural industry and services provided a demonstration of the potential gains from reform, and created competitive pressures for urban sectors to reform as well. Without successful reforms in agriculture, which increased agricultural productivity and released resources to work elsewhere, and rapid development of the rural nonfarm sector, the reforms and rapid growth in the urban sector since 1984 would have been impossible.

[11] Fan and Cohen (1999) have argued that China is at a turning point in its development, and is moving from taxing to subsidizing agriculture.

[12] Calculated by the authors using data from the World Development Report, 1999.

III Empirical Analysis

1. Conceptual framework

There have been some studies on the determinants of rural poverty in China. One significant feature of previous studies is the use of a single equation approach to determine the correlation between rural poverty and explanatory variables. There are at least two disadvantages to this approach. First, many poverty determinants such as income, production or productivity growth, prices, wages and non-farm employment are generated from the same economic process as rural poverty. In other words, these variables are also endogenous variables, and ignoring this characteristic leads to biased estimates of the poverty effects. Second, certain economic variables affect poverty through multiple channels. For example, improved rural infrastructure not only reduces rural poverty through improved growth in agricultural production, but also affects rural poverty through improved wages and non-farm employment. It is very difficult to capture these different effects in a single equation approach.

This study uses a simultaneous equations model to estimate the various effects of government expenditure on production and poverty through different channels. Under this framework, we are able to pinpoint the effects of different types of public investment that we reviewed in the last section. (For detailed discussion of the equation systems and model estimation, please refer to IFPRI EPTD Discussion Paper No. 66 by the same authors)

2. Data and results

Data A panel data set including 25 provinces over the period of 1970 - 1997 was constructed from various governmental sources. There have been several estimates of rural poverty in China. The official statistics indicate that the number of the poor had declined to about 50 million by 1997. The World Bank (Piazza and Liang 1998) has similar estimates to the Chinese official statistics. A third set of estimates, which use a much higher poverty line (Ravallion and Chen 1997), indicate that a far greater proportion of the total population is subject to poverty, with a poverty incidence of 60 percent in 1978 and 22 percent in 1995. Khan (1997), using household survey samples, obtained 35.1 percent for 1988 and 28.6 percent for 1995. Although these poverty rates are higher than the official rates, the reported changes over time are similar to the official statistics.

This study will use provincial level poverty data. Khan (1997) estimated provincial poverty indicators (both head count ratio and poverty gap index) for 1988 and 1995 using household survey data. We use both official and Khan estimates in our analysis, but the difference in the results is small because the two sets of poverty figures share similar trends. Our final results are estimated based on the official data because of the availability of poverty data by province for more years.

Results Most of the coefficients are statistically significant at the 5 percent confidence level (one-tail test) or better. The estimated poverty equation supports the findings of many previous studies. Growth in agricultural production, higher agricultural wages, and increased non-agricultural employment opportunities have all contributed significantly to reducing rural poverty. The terms-of-trade variable is also negatively correlated with rural poverty, implying that higher agricultural prices raise farmers' income and reduce rural poverty. This is different from India where higher agricultural prices are positively correlated with rural poverty (Fan, Hazell, and Thorat, 1999). This difference stems from the fact that even poor farmers in China are net suppliers of agricultural products, while most of the rural poor in India are net buyers. The positive and statistically insignificant coefficient for population growth in the regression indicates that population growth is not an important factor of rural poverty. The estimated agricultural production function shows that, agricultural research and extension, improved rural infrastructure, irrigation, and education have contributed significantly to growth in agriculture.

3. Marginal effects of government expenditure on growth and poverty

Using the system equations, we can derive the marginal returns of different types of government expenditure on agricultural production and rural poverty. The estimated elasticity coefficients measure the direct impact of each spending item on the dependent variable in each equation. But the full model captures indirect as well as direct impacts. To capture the full impact requires totally differentiating

the full equations system with respect to each investment variable of interest. The marginal returns are calculated by multiplying the elasticities by the ratio of the poverty or production variable to the relevant government expenditure item in 1997, and they are presented in Table 4. The annual return to agricultural production is measured in yuan for each additional yuan of government expenditure. The return to poverty shows the number of poor people who would be raised above the poverty line for each 10 thousand yuan of additional government expenditure. These measures are directly useful for comparing the relative benefits of an additional unit of expenditure on different items in different regions. As such, they provide crucial information for policy makers in setting future priorities for government expenditure to better achieve production growth and to reduce rural poverty.

An important feature of the results is that all the production-enhancing investments considered offer "win-win" strategies in that they increase production growth in agriculture while at the same time reducing rural poverty. There appears to be no tradeoffs between these two goals for any individual investment. However, there are sizable differences in the production gains and poverty reductions among various expenditure items and across regions.

For the country as a whole, government expenditure on education has by far the largest impact on poverty alleviation. Every additional 10,000 yuan of investment in education raises 6.3 people above the poverty line. In addition, education investments have the second largest impact on production growth; each additional yuan investment in education leads to 6.68 yuan of additional agricultural output. Therefore, investing more in education is the dominant "win-win" strategy. Public R&D has the largest impact on agricultural production and the third largest impact on rural poverty. It is another "win-win" investment strategy.

Investment in rural telecommunications has the third and second largest impact on production growth and poverty reduction, respectively. Road investments rank fourth in their production and poverty alleviation impacts. Investment in electricity has the fifth largest impact on poverty reduction and production growth. These investments in infrastructure (telecommunications, roads, and electricity) contribute to poverty reduction through increased nonfarm employment, as well as through agricultural production growth. The former often accounts for more than 50 percent of the total poverty reduction effect. Investment in irrigation has the least impact on both production and poverty alleviation.

Table 3. Effects on Poverty and Growth of Additional Government Expenditure, by Type of Investment and Region

	Coastal region	Central region	Western region	China
Returns to agricultural production			yuan/ yuan investment	
R&D	7.33	8.53	9.23	7.97
Irrigation	1.40	0.98	0.93	1.15
Roads	3.69	6.90	6.71	4.91
Education	6.06	8.45	6.20	6.68
Electricity	3.67	4.89	3.33	3.90
Rural telephone	4.14	8.05	6.57	5.29

Regional variations in the returns to government spending are large. In terms of production growth in agriculture, R&D investment has the highest return in the western region, while irrigation investment has the highest return in the coastal region. For education and rural infrastructure (including roads, electricity, and communications), the central region gives the highest return. In the coastal region, a large amount of land has already been converted for non-agricultural use due to rapid industrialization and urbanization. Moreover, the incentives to intensify farming are lower there because of greater non-farm employment opportunities. On the other hand, the land in the western region is more marginal with limited water and poor soil quality. Therefore, the major growth potential for agricultural production lies in the central region where land is relatively less scarce and agricultural production is still the main source of income for farmers.

In terms of poverty effects, all types of investments have their biggest impact in the western region, followed by the central region and then the eastern region. This is because most of the poor in China are concentrated in the west. There are some poverty pockets in the central region, but virtually none in the coastal areas according to the poverty data reported by the Chinese government. Therefore, investing more in the western region

should be a top priority for the government if it wishes to reduce the number of the poor. There are clearly some tradeoffs between growth and poverty alleviation if one looks across regions. However, the sacrifice in growth by investing more in the western region is small. But, if the government wishes to maximize production growth, then investment should definitely be targeted to the central region. However, if the government wishes to maximize poverty reduction, then investment should be targeted to the western region.

IV. Conclusions

Using provincial level data for 1970 - 1997, this study has developed a simultaneous equations model to estimate the effects of different types of government expenditure on rural poverty and production growth in China. The results show that government spending on production enhancing investments, such as agricultural R&D and irrigation, rural education and infrastructure (including roads, electricity, and communications) have all contributed to agricultural production growth and to reductions in rural poverty. But different types of investments yield different poverty and production effects, and these impacts vary greatly across regions.

Government expenditure on education has the largest impact on poverty reduction and the second largest impact on production growth; it is the dominant "win-win" strategy. Government spending on agricultural research and extension has the largest effect on agricultural production growth, and the third largest impact on poverty reduction. Government spending on rural infrastructure (communications, roads, and electricity) has the second, fourth and fifth largest impacts on rural poverty reduction, respectively. These poverty reduction effects mainly come from improved nonfarm employment and increased rural wages. Irrigation investment has had only modest impact on growth in agricultural production and an even smaller impact on rural poverty reduction even after trickle-down benefits have been allowed for.

The results also show that if the government wishes to maximize agricultural production, then it should definitely target more of its investments to the central region; if the government wishes to maximize poverty reduction, then greater investments should be targeted to the western region. But, the sacrifice in growth by investing more in the western region is small. Understanding the tradeoffs among various types of public investment is instrumental for policy makers to target growth and poverty more effectively.

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China to Open Market Fund Management to Foreign Companies

China will allow foreign fund management companies to help manage part of China's US$ 6 billion pool of social security funds.

The vast bulk of China's pension funds are currently held in bank deposits and treasury bonds which generate very low yields. China has begun a drive to reform the system to allow pension plans to pay higher returns in future while curbing financial risk.

When the government gives the go-ahead for some of the pension funds to be invested in domestic stocks, foreign firms will be allowed to manage a portion. The draft regulations on stock market investment by social security funds have been sent to the State Council for final approval and that if everything goes smoothly, the regulation will be unveiled before October 2001. The regulation will outline a detailed policy for the involvement of foreign fund management companies in the market.

Foreign and domestic companies would be treated on an equal footing with the selection of candidates to manage the funds being made by the State Social Security Fund Management Council.