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HOW AGRICULTURAL RESEARCH AFFECTS URBAN POVERTY IN DEVELOPING COUNTRIES: THE CASE OF CHINA

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ABSTRACT

This paper develops a framework to measure the impact of agricultural research on urban poverty. Increased investments in agricultural R&D can lower food prices by increasing food production, and lower food prices benefit the urban poor because they often spend more than 60% of their income on food. Application of the framework to China shows that these food price effects are large and that the benefits for the urban poor have been about as large as the benefits for the rural poor.

KEYWORDS: developing countries, China, agricultural research, urban, poverty

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1. INTRODUCTION

Many studies have shown that investments in agricultural research can yield favorable economic returns (Alston et al. 2000), and contribute to significant reductions in rural poverty (Kerr and Kolavalli 1999; Fan, Hazell, and Thorat 2000; Fan, Zhang, and Zhang 2000; Hazell and Haddad 2001). The links between agricultural research and food price benefits for consumers have also been quantified, using the consumer surplus as a welfare measure (Akino and Hayami 1975; Mellor 1975; Scobie and Posada 1978; and Pinstrup-Andersen 1979). But little work has been done on quantifying the impact of agricultural research on urban poverty reduction, despite the fact that rapid urbanization is increasing the incidence of urban poverty in developing countries (Haddad et al. 1999; Ravillion 2000). This paper is intended to help fill that gap, and reports on an econometric study of the links between past expenditures on agricultural research and urban poverty reduction in China.

We find that past investments in agricultural research made important contributions towards reducing urban poverty in China, and this was largely because agricultural research led to lower food prices. The food price effects attributable to agricultural research investments accounted for 18-30% of the reduction in urban poverty between 1992 and 1998. Our estimate

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of the number of urban people lifted out of poverty for each 10,000 *yuan* of investment in agricultural research is very similar to earlier estimates of the number of rural people also lifted out of poverty. The number of poor people helped by agricultural research has declined over the years as food has become more plentiful and cheaper, but with rapid urbanization, maintaining adequate levels of agricultural research will be critical for containing urban poverty. Unfortunately the government has allowed the level of investment in agricultural research to stagnate in recent years, which does not bode well for the future.

The paper is organized as follows. We first review the historical trends in agricultural research investment in China, followed by a brief discussion of changes in urban poverty. We then present a conceptual framework and model for our analysis on how agricultural research affects the urban poor in China, and then discuss the estimation procedures and results. We conclude with some policy implications.

2. AGRICULTURAL RESEARCH INVESTMENT

Government spending on agricultural research in China has increased significantly over the past four decades, but not without substantial year-to-year variations (Table 1). Investment in agricultural research was quite modest during the first five-year (1953-57) plan, averaging 72 million *yuan* per annum (all values in 1990 prices). During the Great Leap Forward period (1958-60), expenditures on agricultural research increased dramatically to 497 million *yuan* per year, but then fell to 425 million *yuan* per year during the following three years. Research expenditure increased modestly to 643 million *yuan* during the Cultural Revolution period, and then increased steadily thereafter until 1994. Since then, agricultural research expenditures have shown little increase, which is worrying given their importance to national food security and poverty alleviation.

Public research agencies in China employ more agricultural scientists than any other public system in the world. There are three identifiable phases in the development of China's research personnel that have not always paralleled the pattern of funding (Table 1).

Table 1--Public Investment in Chinese Agricultural Research

	Agricultural Research Expenditures	Number of Scientists	Expenditures Per Scientist	As a Percentage of Total Government Spending	As a Percentage of Total R&D Expenditures	As a Percentage of Total Government Spending in Agriculture	As a Percentage of Total AgGDP
	Constant 1990 Million Yuan		*Constant 1990 Yuan*	*%*	*%*	*%*	*%*
1953-57	72	n.a	n.a	0.11	11.04	1.49	0.12
1958-60	497	2,122	n.a	0.38	10.17	3.25	0.54
1961-65	425	7,469	56,829	0.56	10.24	3.90	0.57
1966-76	643	11,621	55,883	0.45	9.93	4.53	0.43
1977-85	1,348	30,257	45,669	0.56	10.34	5.24	0.44
1986-90	1,725	53,598	32,480	0.51	11.90	6.16	0.39
1991-94	2,099	61,876	33,886	0.54	14.29	6.14	0.39
1995-97	2,203	64,352	35,211	0.53	12.06	8.42	0.32

Sources: Fan and Pardey (1992), Fan and Pardey (1995), and State Statistical Bureau and State Science and Technology Commission (various years).

During the 1950s and 1960s, the number of researchers increased steadily. By 1973 there were about 10,000 scientists working in the Chinese system. From 1973 to 1990, there was a rapid increase in research personnel, from slightly over 10,000 researchers to almost 60,000--a rate of increase that exceeded 10% per annum. During the third stage (since 1990), the number of the researchers has stabilized around 60,000.

This increase in the number of researchers combined with slower growth in research expenditures caused expenditures per scientist to decline sharply from 1979 to 1982. Although research expenditures per scientist increased substantially in nominal terms after 1984, they increased only marginally in real terms.

Agricultural research expenditures as a percentage of total government expenditure were comparatively low in the 1950s, averaging 0.10% during 1953-57 and 0.38% during 1958-60. Since then the ratios have been relatively stable hovering around 0.50% to 0.55%, except during the Cultural Revolution when the share was substantially lower. Agricultural research spending as a share of total national R&D expenditures has also been quite stable. China earmarked about 10 - 13% of total R&D expenditures for agriculture during the past four decades. In contrast, agricultural research expenditures as a percentage of government spending on agriculture increased steadily, from 1.5% during the first five-year plan period to over 6% in the last decade.

As a percentage of agricultural gross domestic product (AgGDP), agricultural research investment was a relatively low, 0.12% during the first five-year plan period, but it increased dramatically to 0.54% during the Great Leap Forward period. The percentage has gradually declined to below 0.4% in recent years. This indicates that government investment in agricultural research has increased substantially in absolute terms for the past several decades, but has declined relative to the size of the agricultural sector.

The contribution of research investment to agricultural growth has been enormous. Fan and Pardey (1997) show that research-induced technical change accounts for 20% of the growth in agricultural output since 1965. The rates of returns of this investment are also higher, ranging from 35 % to 90% (Fan 2000).

3. URBAN POVERTY

Compared to rural poverty, urban poverty is small in China. Using a poverty line of $1.0 income per capita per day measured in 1985 purchasing power parity (or 1985 PPP dollar), the incidence of rural poverty was 11.5% in 1998, and the number of rural poor was 103 million (World Bank 2000). In contrast, the incidence of urban poverty was only 2.06% and the number of urban poor was 6.32 million (Table 2), or about 5% of the nation's total poor.

Table 2--Poverty and Income in Urban China

	Per Capita Income (*yuan*)	Incidence of Poverty (%)			Number of Poor (million)			Engle Coefficient	
		($1.0/day)	($1.5/day)	($2/day)	($1.0/day)	($1.5/day)	($2/day)	All Sample	Poor
1992	2191	2.09	13.74	35.66	5.22	34.32	89.06	56.48	60.80
1994	2686	2.73	13.18	29.49	7.46	36.00	80.55	55.10	62.85
1995	2828	1.65	10.28	25.73	4.70	29.26	73.22	55.01	62.03
1996	2879	1.69	8.41	23.31	4.92	24.50	67.92	52.91	60.37
1997	3001	2.00	9.21	21.36	5.98	27.53	63.85	51.49	59.27
1998	3078	2.06	8.86	19.58	6.32	27.17	60.04	49.87	58.01
Annual growth rate 1992-98	5.83	-0.24	-7.05	-9.51	3.23	-3.82	-6.36	-2.05	-0.78

Note: Per capita income is measured in 1992 prices. Total consumption expenditures are used for poverty measures. The Engle coefficient is calculated as the share of food expenditure in total expenditures for the households who have per capita consumption expenditure of less than $2.0 per day.

However, there are good reasons to use a higher poverty line when measuring urban poverty. One prominent reason is the much higher cost of living for urban than rural residents. Consequently, in this study we also use poverty lines of $1.5 and $2.0 per capita per day. This leads to significant increases in the estimated number of urban poor in 1998, from 6.32 million when using the $1.0 poverty line to 27.17 million and 60.04 million, respectively, when using the $1.5 and $2.0 poverty lines.

One important characteristic of the urban poor in China is the high share of total consumption expenditure they spend on food. If the $2.0 per capita per day poverty line is used, then in 1998 the urban poor spent about 58% of their total expenditures on food, compared to 50% for the average urban population. Clearly the urban poor would suffer more than most from higher food prices.

4. ECONOMIC MODEL

To analyze the links between agricultural research and urban poverty, we developed an econometric model in which an agricultural production function, price determination function, and urban poverty equation are simultaneously determined. This is because many poverty determinants such as income and its distribution, production or productivity growth, and prices are generated from the same economic process as poverty and hence must be specified as endogenous to avoid estimation biases. Also, since agricultural research investments affect poverty through changes in food prices, it is difficult to capture this link using a single equation approach.

$$(1) \qquad Y = h(LAND, LABOR, FERT, MACH, R_1, R_2, \ldots, R_I, IRRI, SCHY, ELEC, ROADS, RTR, RAIN, X)$$

(2) $$FP = g(Y, GDP, POP, WPI, S)$$

(3) $$UP = \text{¦}(FP, M, GINI, Z)$$

Equation (1) is an agricultural production function. The dependent variable (*Y*) is agricultural output measured in constant prices. Arable land (*LAND*), labor (*LABOR*), machinery (*MACH*), and fertilizer (*FERT*) are included as conventional inputs. We also include the following variables in the equation to capture the impact of technology, infrastructure and education on agricultural production: current and lagged government spending on agricultural research (RDE, $RDE_{-1}, \ldots, RD_{-i}$); percentage of the total cropped area that is irrigated (*IRRI*); average years of schooling of rural population (*SCHY*); road density (*ROADS*), agricultural electricity consumption (*ELECT*), and number of rural telephone sets (*RTR*). Annual rainfall (*RAIN*) is included to capture the impact of agroclimatic conditions and weather fluctuations on agricultural production.

Institutional changes and policy reforms have made important contributions to growth in agricultural and nonagricultural production and poverty reduction in rural China (Fan 1991, and Fan and Pardey 1997). We do not need to estimate these contributions for the purposes of this study, but in order to reduce possible estimation biases that may arise from neglecting them, we added year and province dummies (*X*) to capture year-specific institutional and policy changes as well as the effects of any remaining agroclimatic factors on growth in agricultural production. This specification is more flexible than Fan (1991) and Fan and Pardey (1997) who used time-period dummies for longer periods to capture the effects of institutional change on production growth.

Equation (2) models the determination of food prices (*FP*). Food prices are measured as a ratio of food prices to nonfood consumer prices. Growth in agricultural production (*Y*) increases the supply of agricultural products and hence is expected to contribute to lower food prices. Per capita GDP (*GDP*) and population size (*POP*) are used to capture demand-side factors in the food markets. Food prices in China may also be affected by international markets (*WPI*), although during most of the study period the share of imports and exports in total domestic consumption was small, often less than 3%. Variable *S*, which consists of a set of province level dummies, is intended to capture the effect of all other factors on changes in food prices.

Equation (3) models the determinants of urban poverty (*UP*)[4]. Urban poverty is expected to be positively related to food prices changes relative to nonfood prices (*FP)* and to inequality in urban incomes (GINI), and negatively related to the per capita income of urban residents (*M*). Variable *Z* (which comprises year and province dummies) is included to capture the effects of all other omitted variables.

5. DATA AND MODEL ESTIMATION

Data

The urban poverty and income variables were constructed from China's urban household survey. The urban household survey is conducted annually by the National Statistical Bureau to monitor changes in urban household expenditures and consumption. A total of 40-50,000 households were surveyed annually between 1992 and 1998. We were able to obtain access to 10% of the total sample, taken from one representative city in each province.

To obtain appropriate poverty measures, we first had to convert our chosen poverty lines ($1.0, 1.5 and 2.0 per capita per day, measured in 1985 purchasing power parity) into local

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[4] To simplify the presentation, we have omitted to include subscripts to indicate observations in year t and at the province level the variables with subscript "-1,...-j" indicate observations in years *t-1*,...*t-j*.

currency at nominal prices. To do this, we first converted the poverty line from 1985 PPP dollars into Chinese currency based on the 1985 PPP exchange rate. Then we used the Chinese consumer price index to calculate the national poverty lines at current prices. Finally, province-level poverty lines were calculated by adjusting for differences in the cost of living by province.[5]

To measure urban poverty *(UP)*, we used the percentage of the urban population that had less than the chosen poverty line when measured in 1985 purchasing power parity. Our baseline results were obtained using a poverty line of $1.5 per capita per day, but we also ran the model using other poverty lines to check the sensitivity of the results. We chose a baseline poverty line of $1.5 because this is broadly comparable to the widely used $1.0 poverty line for rural areas.

The average per capita income of the urban population *(M)* was calculated from the urban household expenditure survey, using the urban consumer price index as a deflator. The food price variable *(FP)* was measured as the food procurement price index relative to the urban consumer price index. The GDP variable is gross domestic product measured in constant prices. The population variable *(POP)* is the combined population of urban and rural areas.

Agricultural production inputs are measured as follows: land *(LAND)* is arable land only; labor *(LABOR)* is the person-year equivalency of all workers engaged in agricultural production; fertilizer *(FERT)* is the total nutrient content of all chemical and organic fertilizers used in agriculture; draft power *(MACH)* is an aggregation of total machinery horsepower plus draft animals measured in "horsepower equivalents"; and irrigation *(IRRI)* is the percentage of irrigated area in total arable land. For education *(SCHY)*, we used data on the percentage of the population with different education levels to calculate the average years of schooling, assuming 0

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[5] China did not start radical price reforms until 1984. Before that, prices were strictly controlled by state governments and were allowed to vary by only a few percentage points across provinces. We therefore assume that price levels were the same for all provinces in 1984. Kanbur and Zhang (1999) and Yang and Cai (2000) have adopted similar methods to calculate real expenditure levels across regions.

years for a person who is illiterate and semi-illiterate, 5 years for a person with primary school education, 8 years for a person with junior high school education, 12 years for a person with high school education, 13 years for a person with professional school education, and 16 years for a person with college education. Our road variable *(ROADS)* is defined as road density, measured as length of roads in kilometers per thousand square kilometers of geographic areas.

Public investment in agricultural R&D is reported in the total national science and technology budget. The sources of agricultural R&D investment are from different government agencies. Science and technology commissions at different levels of government allocate funds to national, provincial, and prefecture institutes primarily as core support. These funds are primarily used by institutes to cover researchers' salaries, benefits, and administrative expenses. Project funds come mainly from other sources including departments of agriculture, research foundations, and international donors. Recently, revenues generated from commercial activities (development income) have become a particularly important source of revenue for the research institutes. The research expenditures reported in this study include only those expenses used to directly support agricultural research. The data reported here were taken from Fan and Pardey (1992) and various publications from the Government Science and Technology Commission and the Government Statistical Bureau. Research expenditures and personnel numbers include those from research institutions at national, provincial, and prefecture levels and agricultural universities.

Input and output data are taken from various statistical yearbooks of the State Statistical Bureau and Ministry of Agriculture. Road density and education levels are taken from various issues of *China's Transportation Yearbook*, *China Population Yearbook*, and *China's Education Yearbook*.

Functional Form and Estimation Technique

We used double-log functional forms for all equations in the model. More flexible functional forms, such as the translog or quadratic, impose fewer restrictions on estimated parameters, but many coefficients are not statistically significant due to multicollinearity problems among the many interaction variables. For our system-level estimation, we used the full information maximum likelihood technique.

Since our urban poverty data by province are only available for six years (1992 and 1994 to1998), a two-step procedure was used in estimating the full equations system. The first step involved estimating the production and price functions for 1970 to 1998 and calculating predicted values of *AP* at the provincial level using the estimated parameters. The second step then involved estimation of the poverty equation using the predicted values of the *FP* variable and available poverty data for 1992 and 1994-98. The advantage of this procedure is that it uses all the information available for estimating the production function and food price equations, and therefore increase the reliability of the estimates. It also avoids endogeneity problems with many of the variables in the poverty equation.

Lags and Distributions of R&D Investments

Government investments in R&D can have long lead times in affecting agricultural production, as well as long-term effects once they kick in. One of the thornier problems to resolve when including agricultural research investments in a production function concerns the choice of appropriate lag structure. Most past studies use stock variables which are usually weighted averages of current and past government expenditures on R&D. But what weights and how many years lag should be used in the aggregation are currently under hot debate.[6] Since the shape and length of these investment lags are largely unknown, we use a free form lag structure in our analysis, i.e., we include current and past government expenditures on R&D in the production function. Then we use statistical tools to test and determine the appropriate length of lag for R&D expenditure.

Various procedures have been suggested for determining the appropriate lag length. The adjusted R^2 and Akaike's Information Criteria (*AIC*) are often used by many economists (Greene 1993). In this report, we simply use the adjusted R^2. Since the R^2 value estimated from a simultaneous equations system does not provide the correct information on the goodness of fit of the estimated model, we use the adjusted R^2 from a single equation approach to the production function equation. The optimal lag length is determined by the length of lag that maximizes the adjusted R^2. The *AIC* is similar in sprit to the adjusted R^2 in that it rewards goodness of fit, but it penalizes for the loss of degrees of freedom. The lag determined by the adjusted R^2 approach is 17 years.

Another problem related to the estimation of the lag structure is that the independent variables (RDE, RDE_{-1}, RDE_{-2}, ... and RDE_{-i}) are often highly correlated, making the estimated coefficients statistically insignificant. Several ways of tackling this problem have been proposed. The most popular approach is to use what are called *polynomial distributed lags*, or *PDLs*. In a polynomial distributed lag, the coefficients are all required to lie on a polynomial of some degree *d*. In this report, we use *PDLs* of degree 2. In this case, we only need to estimate three instead of $i+1$ parameters for the lag distribution. For more detailed information on this

[6] Alston *et al*. (1999) argue that research lag may be much longer than previously thought, perhaps even infinite. But this argument may be less relevant for most developing countries since their national agricultural research systems are much younger and their research tends to be more applied and hence has shorter useful life.

subject, refer to Davidson and MacKinnon (1993). Once the lengths of lags are determined, we estimate the simultaneous equations system with the *PDLs* and appropriate lag length for research investment.

Estimation Results

The estimated model is presented in Table 3. Two sets of results are reported for the poverty determination equation, corresponding to poverty lines of $1.5 and $2 per capita per day. Most of the estimated coefficients are statistically significant at the 5 percent confidence level (one-tail test) or better. Since we used double-log functional forms, the estimated coefficients are in elasticity form.

Table 3--Estimates of the Simultaneous Equation System

(1)	Y =	0.336 LAND	+ 0.229 LABOR	+ 0.351 FERT	+ 0.083 MACH	+ 0.274 IRRI	+ 0.087 RDE	R^2 = 0.976
		(4.83)*	(2.98)*	(6.70)*	(1.48)	(4.57)*	(3.25)*	
		+ 0.100 ROAD	+ 0.132 ELECT	+ 0.158 SCHY				
		(4.22)*	(6.09)*	(4.93)*				
(2)	FP =	- 0.430Y	- 0.023 GDP	+ 0.386 POP	+ 1.620 WPI			R^2= 0.798
		(3.01)*	(-0.16)	(1.50)	(1.11)			
(3a)	P =	– 3.54 M	+ 1.04 GINI	+ 1.69FP				R^2 = 0.908
		(-16.35)*	(2.69)*	(4.37)*				
(3b)	P =	– 2.13 M	+ 0.529 GINI	+ 1.41FP				R^2 = 0.916
		(-9.43)*	(1.83)*	(5.11)*				

Note: Asterisk indicates significance at the 5% level. The coefficient for RDE is the sum of the coefficients for the past 17 years, and the *t-value* of the coefficient is the joint *t-value* of the coefficients for the past 17 years. The dependent variable in equation 3a is the incidence of urban poor using the $1.5 per day poverty line, while the independent variable in equation 3b is the incidence of poverty using the $2 per day poverty line.

The estimated agricultural production function (equation (1)) confirms that agricultural research, improved roads, irrigation, access to electricity, and education all contributed significantly to agricultural production over the sample period. The coefficient reported for agricultural R&D is the sum of the past 17 years coefficients from the *PDLs* distribution. The significance test is the joint *t* test of the three parameters of the *PDL*.

The estimated food price equation (equation (2)) indicates that increases in agricultural output do exert a strong downward pressure on food prices with an elasticity of 0.43. However, per capita GDP and total population size have statistically insignificant impacts on agricultural prices. World food prices also have an insignificant impact on domestic food prices, indicating that past price policies have acted to buffer domestic prices from world price movements.

The estimated poverty equations (3a and 3b) show that food prices have a very significant impact on urban poverty, and this result holds for both the poverty lines measures used. For every one percent decline (increase) in food prices, urban poverty is reduced (increased) by 1.69% when the poverty line is \$1.5, and by 1.41% when the poverty line is \$2.0. Growth in per capita income has also contributed significantly to rapid reductions in urban poverty while a worsening income distribution in urban areas has worked to increase urban poverty.

6. ELASTICITIES AND CONTRIBUTION OF AGRICULTURAL RESEARCH TO URBAN POVERTY

By totally differentiating equations (1) - (3), the impact of government investment in agricultural R&D in year *t-i* on poverty at year *t* can be derived as:

(4) $dUP/dRDE_{-i} = (\ UP/\ FP)(\ FP/\ Y)(\ Y/\ RDE_{-i}).$

By aggregating the total effects of all past government expenditures on R&D over the lag period, the sum of marginal effects is obtained for any particular year. This is equivalent to the marginal impact of a change in the "stock" of R&D investment at times, where the stock *RS* is measured as:

$$RS_t = a_t RE_t + a_{t-1} RE_{t-1} + \ldots, + a_{t-17} RE_{t-17},$$

and a_{t-i} coefficients are the estimated parameters in the production function (equation 1).

When the poverty line of $1.5 per capita per day is used, the estimated elasticity of urban poverty to agricultural research is –0.064. That is, for every one percent increase in agricultural research investment, urban poverty declines by 0.064%. But with a poverty line of $2.0, the elasticity declines to -0.053. Lowered food prices due to agricultural research accounted for 18% of poverty reduction over 1992-98 with a poverty line of $1.5, but 30 % with a poverty line of $2.

Using these elasticities and the values of the relevant variables for specific periods of time, we can calculate the number of poor urban people raised above the poverty line for an additional 10,000 *yuan* increase in the stock of agricultural research investment. Similarly, we can calculate the total number of urban poor who were lifted out of poverty each year as a result of actual investments in agricultural research. The results are shown in Table 4.

Table 4--Impact of Agricultural Research on Urban Poverty

	Number of Poor Reduced Per 10,000 Yuan		Total Number Reduced (Million)	
	$1.5/day	$2/day	$1.5/day	$2/day
1992	6.08	12.78	6.27	13.19
1994	5.27	9.88	4.51	8.45
1995	4.27	9.10	3.32	7.09
1996	3.31	7.73	2.59	6.03
1997	5.05	9.86	4.01	7.83
1998	3.96	7.91	2.96	5.91

Using the results obtained with the $1.5 poverty line, each additional 10,000 *yuan* increase in the 1992 stock of agricultural research lifted 6.08 urban people out of poverty. This figure had declined to 3.96 for increases in the 1998 stock of agricultural research. Given actual levels of investment in agricultural research, then 6.27 million urban people were lifted out of poverty in 1992 and 2.96 million in 1998. This decline in poverty impact since 1992 suggests that agricultural research investments may have been even more effective in helping the urban poor prior to 1992. Unfortunately, we do not have urban poverty data from earlier years to test this proposition.

The incremental poverty reduction effects are much larger when the $2 poverty line is used instead. In this case, every 10,000 *yuan* increase in the 1992 stock of agricultural research investment lifted 12.7 urban people out of poverty, and a similar increase in the 1998 stock of agricultural research investment lifted 7.9 urban people out of poverty. The total number of urban people lifted out of poverty by actual research expenditures is also much higher; 13.2 million in 1992 and 5.9 million in 1998.

The results obtained here for the urban poor are quite comparable with similar calculations of the impact of agricultural research investments on the rural poor. For example, Fan et al. have estimated that for every 10,000 *yuan* increase in the stock of agricultural research investment, 7.8 rural people were raised out of poverty in 1997 (Fan, Zhang, and Zhang 2000). The large impact on rural poverty comes from not only increased agricultural productivity, but also from greater nonfarm employment as a result of agricultural and nonfarm sector linkages.

7. CONCLUSIONS

This study has estimated the impact of agricultural research investments on urban poverty in China using time series data and an econometric modeling approach. The model explicitly tracks the causal links between agricultural research investments and subsequent production increases in agriculture, and how this impacts on food prices and the incidence of urban poverty. The results show that agricultural research has played an important role in reducing urban poverty in China, accounting for 18-30% of urban poverty reduction between 1992 and 1998. Without increased investment in agricultural research, urban poverty in China would be much higher today. Each 10,000 *yuan* increase in the stock of agricultural research investment raises about as many urban people as rural people above the poverty line. The strength of this impact has declined over time as per capita incomes have risen and food has become a less dominant item in most households' budgets. But with rapid urbanization, agricultural research will still need to play a key role in supplying adequate food at affordable prices to ensure that urban and rural poverty remain low.

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