

AGRICULTURE, RURAL INDUSTRIES, AND PEASANT INCOME IN CHINA*

YUSHENG PENG

The Chinese University of Hong Kong

Agricultural reform and liberalization since 1978 paved the way for the unprecedented rapid growth of a dynamic nonagricultural sector in rural China, spearheaded by township and village enterprises (TVEs). Playing an increasingly important role in rural and national economy, TVE development has rapidly improved peasant income and reversed a centuries-long pattern of involuntarily growth of output at diminishing marginal labor productivity in the Chinese countryside. Using 1991 county-level data (N=1,883), this paper shows that the nonagricultural sector, pushed by shortage of farmland and fueled by urban economic spillovers, raised peasant income and the spatial inequality of income through enhancing returns to mass education and rural labor supply. It also finds a positive relationship between lagged agricultural output and nonagricultural growth, whereas lagged agricultural output had a weak but significant effect on agricultural growth.

INTRODUCTION

The classic example of economic development is the synchronized process of industrialization and urbanization, as happened two hundred years ago in England or more than one hundred years ago in the United States. Industrial growth absorbs rural population into towns and cities and thus leads to urban expansion. In the contemporary developing world, however, this scenario rarely plays out. Typically population outgrows industry, resulting either in urban slums or in rural poverty. Under such circumstances rural industrialization becomes a feasible alternative strategy for increasing rural income and creating employment, as adopted in many Asian countries (Blank and Parish 1990; Ho 1982, 1986).

China is no exception. When the Chinese Communist Party took over China in 1949, the country had a very small modern industrial sector

*Direct all correspondence to Department of Sociology, the Chinese University of Hong Kong, Shatin, N.T., Hong Kong. (Email: yushengpeng@cuhk.edu.hk). This study is partly supported by the South China Programme, Chinese University of Hong Kong. An earlier version of the paper was presented at the annual meetings of the American Sociological Association, Toronto (August, 1997). For helpful comments, I thank Professor Lucie Cheng, Lau Chong Chor, Michael Darby, Lin Hui, Rance Lee, William Mason, and Lynne Zucker. Special thanks to Lorraine Cheung, Carrie Wong and David Wu for data collection and research assistance.

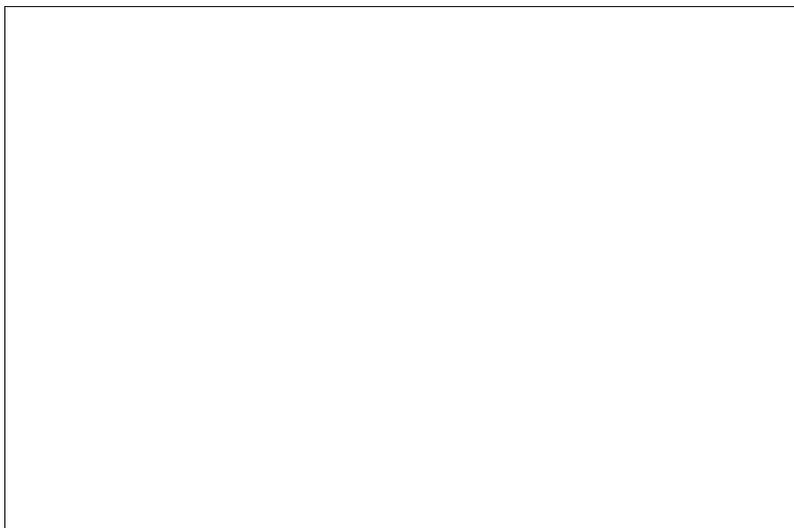
accounting for only ten percent of the national economy. In order to industrialize the country rapidly, Chinese leaders selected a heavy industry oriented development strategy. Military confrontation with the U.S. in the Korean War and the U.S. economic embargo forced China quickly to set up a rather comprehensive and self-contained industrial structure, with heavy industry at its core. This development strategy, together with a forced high accumulation rate, succeeded in creating a relatively complete industrial structure very rapidly. The industrial share of national income increased from 13 percent in 1949 to 47 percent in 1978, and the agricultural share dropped from 68 percent to 34 percent. Because heavy industry was capital-intensive rather than labor-intensive, it was unable to absorb the soaring rural population and slowed down the pace of urbanization. By 1980, only 19.4 percent of the Chinese population lived in the cities, 6.9 percent higher than in 1952 (Lin et al. 1996).

In this historical context, millions of small-scale enterprises began sprouting in the Chinese countryside since the late 1970s. Huang (1990: 244-6) described the rapid growth of the nonagricultural sector in rural China as industrialization without urbanization. He pointed out that rural industrialization and agricultural diversification reversed a centuries-long pattern of growth in agricultural output through labor intensification at diminishing marginal returns and brought about for the first time a genuine possibility for transformative development in labor productivity and peasant income. By using a rich county-level data set, this paper will show that rural nonagricultural development raised peasant income through enhancing the marginal returns to human capital, labor and benefiting from urban economic spillovers.

The next section describes how agricultural reforms paved the way for the burgeoning growth of the nonagricultural sector and raised peasant net income; the third section reviews the literature regarding the effects of human capital, land, labor, and urban economic spillovers on agricultural and nonagricultural production; the fourth section describes the data, measurement, and methodological design; the fifth section presents the empirical analysis; and the last section concludes the paper.

AGRICULTURAL REFORM, RURAL INDUSTRIALIZATION AND PEASANT INCOME

After two decades of collective farming, the Chinese government implemented various forms of household responsibility systems in 1978-83 which shifted the basic unit of accounting and production from the



Source: *Rural Statistical Yearbook of China 1997* (State Statistical Bureau 1997).

FIGURE 1. GROWTH TREND OF AGRICULTURAL AND NONAGRICULTURAL OUTPUT IN RURAL CHINA, 1978-1995

production team to the household through farmland contracts (Lin 1992; Sicilar 1992; Oi 1989). Peasant households have the right to manage their contracted land and the right to dispose its residual income, although they cannot sell the land because the village formally owns it. Markets for agricultural products were slowly introduced in the 1980s and liberalized in the 1990s (Tang 1996). Chinese agricultural reform seems to bear proof for institutional theory. The change in property relations and marketization increased incentives for peasants and boosted agricultural production in the early 1980s (Nee 1986; Lin 1992). Sustained agricultural growth in the second half of 1980s and 1990s is achieved primarily through technological innovations such as the adoption of hybrid rice and the expansion of nonfarming agricultural activities such as fishery and cattle raising (Huang and Rozelle 1996; Lin 1991). Figure 1 presents the gross value of agricultural and nonagricultural output from 1978 through 1995. Over the 18 years, agricultural production maintained a relatively robust growth rate of 6 percent per annum (or 17 percent with inflation).¹

¹ The 6 percent growth rate has been deflated by the overall farm and sideline product purchasing price index, which inflated at 10.28 percent per year on average from 1978 to 1995 (*China Statistical Yearbook 1996*: 255).

The most tangible achievement of agricultural reform was the burgeoning growth of the rural nonagricultural sector, even though Deng Xiaoping himself admitted that this was unexpected (see Ma et al. 1994: 2). The rural nonagricultural sector consists primarily of rural enterprises, commonly referred to as township and village enterprises (TVEs) which account for over 90 percent of the nonagricultural output.² TVEs are the most dynamic sector in China today, as clearly shown in figure 1. From 1978 to 1991 the gross value of nonagricultural output achieved a spectacular growth rate of 29 percent per year, or 22 percent deflated. From 1991 to 1995, it soared at an exceptional growth rate of 48 percent per year, 32 percent deflated.³ In terms of value-added, agricultural sector generated roughly 1,200 billion *yuan* in 1995, or 23 percent of the national GDP; TVEs generated roughly 1,460 billion *yuan* or 26 percent of the national GDP in the same year (calculated from State Statistical Bureau 1996: 42, 390).⁴ Thus, TVEs have been acclaimed as China's new center of growth and profits (Naughton 1995a; Li and Wang 1993).

Rural industrialization in China is made necessary by mounting rural unemployment. China has an acute shortage of farmland and huge rural surplus labor. During the collective era, Chinese peasants had been bound to the limited amount of arable land by a "grain first" policy (Huang 1990; Lu 1995). Rural surplus labor was locked into an "involutionary mode of production" in which growth of total output was achieved by increasing labor input at declining marginal productivity, a pattern of growth characteristic of Chinese agriculture for centuries (Huang 1990). Even though two decades of collective farming had accomplished impressive advances in terms of yields per *mu* of farmland, peasants' real income stagnated and payment per workday declined (Huang 1990: Chap. 11). Rural nonagricultural activities were severely restricted by the state policies. During the 1970s, the Chinese government relaxed its policies and allowed peasants to engage in such industrial activities as farm equipment manufacture, repairs, and fertilizer production only as auxiliaries to agriculture, and not as an alternative development strategy to provide employment for rural population (Ho 1994; Wong 1988). Thus, in 1978, on

² According to the 1991 county-level data set used in this study, TVEs produced 93 percent of the gross value of nonagricultural output. The correlation coefficient between logged nonagricultural output and logged TVE output is 0.887.

³ The deflated growth rates were adjusted by the overall industrial products rural retail price index (State Statistical Bureau 1996: 255).

⁴ The gross value of output is not comparable to GNP or GDP because it includes the value of material inputs. This State Statistical Bureau started to report value-added for TVEs in 1995.

the eve of Chinese economic reform, rural nonagricultural employment accounted for less than 10 percent of rural labor force (*China Labour Statistical Yearbook 1997*: 9, 401). This figure was very low compared with other Asian countries at similar levels of development (Blank and Parish 1990; Ho 1994). It was even low compared with the traditional Chinese rural economy in the pre-communist era, which was highly diversified and developed in commercial and industrial activities (Ho 1994; Zhang 1991).

Decollectivization of agriculture in the late 1970s and early 1980s exposed and freed a huge rural surplus labor and turned it into potential wage labor. One effect was to generate a tide of peasants swarming into cities seeking temporary jobs or filling vacancies in the private service sector (Cheng and Selden 1994; Wu 1994). Another effect of decollectivization was the mushrooming of rural enterprises. In the early 1980s, policy-makers debated over whether the “blind” growth of rural enterprises should be left unchecked or not, because such growth squeezed resources (land, capital, and labor) out of agriculture. It was not until 1984 that the Chinese government decided to endorse and support rural enterprises (Wong 1988: 9-11; Ho 1994: 23-27). By 1996, rural industrial employment accounted for 28 percent of the total rural labor force (*China Labor Statistical Yearbook 1997*: 9, 401).

Growth of Peasant Income

Rural income especially nonagricultural income has been growing rapidly since the reform. Figure 2 compares the growth trend of Chinese peasants' net income from agricultural and nonagricultural sources. From 1978 to 1995, rural net income had been growing at a gross rate of 15.6 percent, or a real rate of 7 percent per annum (deflated by the overall retail price index in State Statistical Bureau 1996: 255). Nonagricultural income grew faster at a gross rate of 22 percent per year than did agricultural income at 13.6 percent per year. The bumps in the growth trend of agricultural income reflect price hikes in agricultural products. For example, the purchase prices of agricultural products increased drastically from 1993 to 1995 and agricultural income grew at about 30 percent a year.

Because of its faster growth rate, the nonagricultural share of peasant total income increased over the years. Nonagricultural income accounted for only 15 percent of total peasant income in 1978. By 1995, its share increased to 37 percent. Even though TVEs produced greater value-added returns than did the agricultural sector in 1995, agricultural income still accounted for the dominant share in Chinese peasant household income. This reflects



Source: *China Statistical yearbook*, various year.

FIGURE 2. GROWTH TREND OF CHINESE PEASANT NET INCOME BY AGRICULTURAL AND NONAGRICULTURAL SOURCES, 1978-1995

the fact that TVEs are mostly owned and run by township and village governments, even though private TVEs are growing faster. A large proportion of the added value generated by TVEs is used for enterprise expansion, public projects and welfare spending. On the other hand, agricultural production is mostly accomplished through the household. Agricultural earnings therefore, are more directly reflected in peasant household income.

The fruit of rural nonagricultural growth is not shared equally. As the nonagricultural contribution to peasant income increases, its contribution to inequality also increases. Rozelle (1994) found that the inter-county Gini coefficient increased significantly from 1983 to 1988; and that the high Gini-coefficient for rural industry and its large and growing share in the economy were almost solely responsible for the large and increasing regional disparities in rural Jiangsu. Instead of exploring the nonagricultural contribution to the rising rural Gini coefficient over time, this paper focuses on how rural agricultural and nonagricultural activities affect peasant household income through altering returns to human capital, labor, land, and urban economic spillovers. The rest section begins with a review of the roles various factor endowments should play in rural

agricultural and nonagricultural development.

HUMAN CAPITAL, LAND, LABOR, AND URBAN SPILLOVERS

Human Capital theorists (Becker 1964; Schultz 1961) have long documented the effects of human capital stock on economic performance, but critics (Collins 1979) argue that education merely serves the function of producing and reproducing class stratification, contributing little to economic growth. Hage, Garnier, and Fuller (1988) respond to the debate by arguing that education has a stronger impact on economic growth when it is related to the needs of the economy. I contend that rural industries need education and training more than does agriculture. Agricultural production in China is scattered among millions of small family farms, with simple technology, small investment, and low risk of bankruptcy. Comparatively, the operation of rural enterprises, even small ones, is much more complicated and requires much more skills, information, and calculation than the operation of family farms. The acquisition of management skills and industrial technology comes from schooling and training, as well as from experience; the acquisition of agricultural skills comes mainly from experience. Therefore, human capital should benefit from the development of rural industries more than from agriculture.

The importance of education for the development of rural industries in China has been suggested by comparative studies (Svejnar and Woo 1990) and analyses of provincial level data (Sengupta and Lin 1993: 190). In his 1989 article in *American Sociological Review*, Nee (1989) argued that the transition to a marketlike economy in rural China increases the returns to human capital, and found a significant effect of education on household income. More recently, Nee (1996: 941) reported a puzzling finding that education did not seem to bring significant returns to peasant household earnings in China. I argue that market reform enhanced income returns to human capital primarily through its strong impact on nonagricultural activities. Schooling raises household earnings primarily through fostering nonagricultural entrepreneurship and increasing nonfarm employment opportunities, variables which Nee controlled in the regression of peasant household earnings.

Human capital can be classified into two types: (1) high-grade scientific and technological research and (2) mass education and skill training. In the development of high technology industries, top scientists play a key role (Zucker, Darby, and Brewer 1994). In low technology industries, mass

education is important (Garnier and Hage 1990; Hage, Maurice and Fuller 1988). Most rural enterprises in China are labor-intensive rather than capital-intensive, reflecting China's comparative advantage of cheap labor supply (Lin, Cai and Li 1996). In 1995, for example, the ratio of net fixed-asset value of state-owned industrial enterprises over number of employees was about 4 times of rural industrial enterprises.⁵ Rural enterprises commonly recycle old equipment from the urban state firms and only the exceptionally successful ones import state-of-the-art foreign equipment. Therefore, general human capital in the form of mass education and skill-training are most needed in China's rural industry. There are, in fact, very few college graduates in the countryside. When rural enterprises do upgrade their technology, they tend to attract skilled workers and technicians from the urban state sector and universities and research institutes, a point to be emphasized below. Peng (1992) and Gelb (1990) found that among the employees in China's rural enterprises, junior high-school education brings the highest return in wages.

Farmland and Rural Labor Supply

Farmland and labor affect rural industrial and agricultural production in very different ways. Farmland and labor are the major factors of input for agricultural production. If there is abundance of farmland, increase in labor input will directly lead to increase in output. But if the acreage of farmland is limited, increasing labor input typically implies labor intensification in the form of increased frequency of cropping, refined cultivation method and soil improvement etc., at diminishing marginal returns to labor. Therefore, shortage of farmland tends to push rural surplus labor to seek nonfarm employment. If available, nonfarm opportunities can alleviate unemployment pressure and increase marginal returns to labor.

China's population doubled from 0.54 billion to 1.1 billion in the forty-year period from 1949 to 1989. The size of China's rural labor force (without urban registration) was about 478 million in 1991 and 490 million in 1996, which accounted for slightly over 70 percent of the total labor force (*China Labour Statistical Yearbook 1997*: 9).⁶ Nationwide, the average land-labor ratio

⁵ The ratio of fixed assets over number of employees of the state-owned industrial enterprises was about 57,800 it/person in 1995 (State Statistical Bureau 1996: 402, 419). For rural industrial enterprises that ratio was 13,500 it/person (TVE Statistical Yearbook 1996: 99-100).

⁶ The official distinction between rural versus urban laborers or "residents" is not a natural distinction between rural and urban dwellers. Rather, it is a purely administrative classification of "grain source" and other privileges (Cheng and Selden 1994; Wu 1994). For

is about 3 *mu* (half acre) per peasant. On the basis of the current rate of agricultural productivity in China, Lu (1993: 236) estimates that no more than 150 million workers are needed for agricultural employment. Therefore, more than two-thirds of these officially classified as peasants are not needed for agricultural production and therefore must find nonagricultural work. In 1996, TVEs in the whole country employed 135 million peasant workers, or 28 percent of the rural labor force (China Labour Statistical Yearbook 1997: 401). Thus even today, at least one-third of Chinese peasants are potentially unemployed and need to find non-farming jobs.

Ho (1995: 60) identified the shortage of farmland and surplus labor as the main push factors leading to the explosive growth of rural enterprises in China in the 1980s. According to a World Bank Survey, creating jobs for local residents was reported by the local cadre as the primary motivator for rural industrialization. Only in a few advanced regions—such as Zhejiang, Jiangsu, and Guangdong—where rural enterprises have exhausted local labor supply, did the goal of employment come secondary to profits in the priority list of the local cadre (Byrd 1990; Wang *et al.* 1995).

Urban Proximity

Rural industry in China is highly concentrated around the immediate hinterland of Chinese cities, rather than being dispersed widely across the countryside (Naughton 1995b:82; Parish 1994:14 and Perkins 1990:90). Naughton (1995a) argues that the explosive growth of TVEs in the 1980s was inseparably connected to new pattern of urban development. In the pre-reform era, rural and urban economies were administratively segmented and cities were physically walled off from the surrounding countryside by a hard and abrupt boundary line. Because the rural market reform progressed more smoothly than the urban reform, the expansionary forces of urban industries spilled over into the surrounding countryside. State-owned enterprises branched out in the form of subcontracting, joint-ventures or business cooperation in the nearby villages to take advantage of the cheap land and labor and weak bureaucratic surveillance. Thus, a large portion of rural industrialization was actually peri-urban industrialization. Around urban centers belts of urbanized countryside emerged in which

example, some cadres in the township government have urban *hukou* because they eat state-supplied grain. In recent years there are also more and more rural laborers living in the city without urban registration and buying food on the newly emerged free market (Lu 1995; Solinger 1995).

factories and paddy-rice fields interlace with each other, more resembling other Asian countries.

Peng, Zucker, and Darby (1997) find that proximity to cities had a large efficiency-shifting effect in the Cobb-Douglas production function of TVEs. They attribute the effect mainly to urban technology spillover embodied in the movement of skilled technical personnel from cities to nearby countryside. Within commuting distance, a large number of technical personnel and skilled workers turn to these booming suburban firms, probably reaping both the high salaries of the market sector and the housing, medical, and children's education benefits provided by spouses' work units in the urban state sector. It is estimated that 3 million urban folk worked in rural enterprises in the early 90s (*China Daily*, February 9, 1993). Li and Wang (1993: 122-132) observed three types of knowledge spillover from cities to the countryside: (1) "borrowing brains" in the form of moonlighting and part-time consulting; (2) "hiring brains" in the form of employing urban technicians and skilled workers (many retirees) with high salaries and recruiting fresh college graduates; (3) "training brains" in the form of sending TVE employees to cities for training. At the early stages the first type of knowledge spillover was dominant and other two types gradually become more widespread.

Proximity to cities may not be an advantage for agricultural production. Urban industrial knowledge is of little use for traditional agriculture. Urban expansion raises the value of the farmland and opportunity cost to rural labor and will probably offset the benefits of proximity to urban markets for vegetable growing, chicken farming, cattle raising and fish breeding. Generally speaking, urban expansion involves agricultural decline on the one hand and industrialization on the other.

Relationship between Agricultural and Nonagricultural Production

Agriculture supports rural industrialization by creating a consumer market and providing initial capital for setting up rural enterprises (Anderson and Leiserson 1980). The role of agricultural accumulation in the initial capital formation for rural enterprises in China is well-documented (Ho 1994: 60; Byrd and Gelb 1990: 364; Wang 1990: 222-3; Peng 1995). Although in advanced regions nonagricultural accumulation outweighs agricultural accumulation, the latter is crucial at the initial stage of TVE capital formation. Agricultural savings can be transformed into capital for rural enterprises primarily through two channels: personal savings and local financial institutions. New private enterprises tend to raise funds

through personal savings due to discrimination they experience in obtaining bank loans. Village-and-township-run enterprises could sell stocks to villagers (*Jizi*) and sometimes do so as a requirement of new recruits (Wong 1988: 25).

It should be pointed out that capital formation process in China is localized because the Chinese banking system is regionalized (Wang 1990). Rural Credit Cooperatives (RCCs) play an important role in transferring agricultural surplus into nonagricultural investment (Naughton 1995a: 153). Before the economic reform, the state used RCCs to transfer modest rural savings to urban uses. During the 1980s rural household saving increased rapidly and the supply of funds to RCCs skyrocketed. The state allowed RCCs to lend a much larger proportion of funds locally, with the initial intention to encourage peasant investment in agriculture and to make up for cuts in state agricultural investment. As a result, these credit co-ops turned out to be effective agents for channeling rural savings into rural industries. In 1991, RCCs throughout the country received total deposits of 271 billion yuan, 85 percent of which were from private households, and lent 100.7 billion yuan to TVEs (State Statistical Bureau 1996: 617). Even though RCCs are the grass-root branches of the Agricultural Bank of China, they operate under the direct control of community governments. Protective of their collective coffers, community governments restrict the flow of local funds out of the community boundary. The mentality is that “fertile water shall not run into other people’s fields” (Wang *et al* 1995).

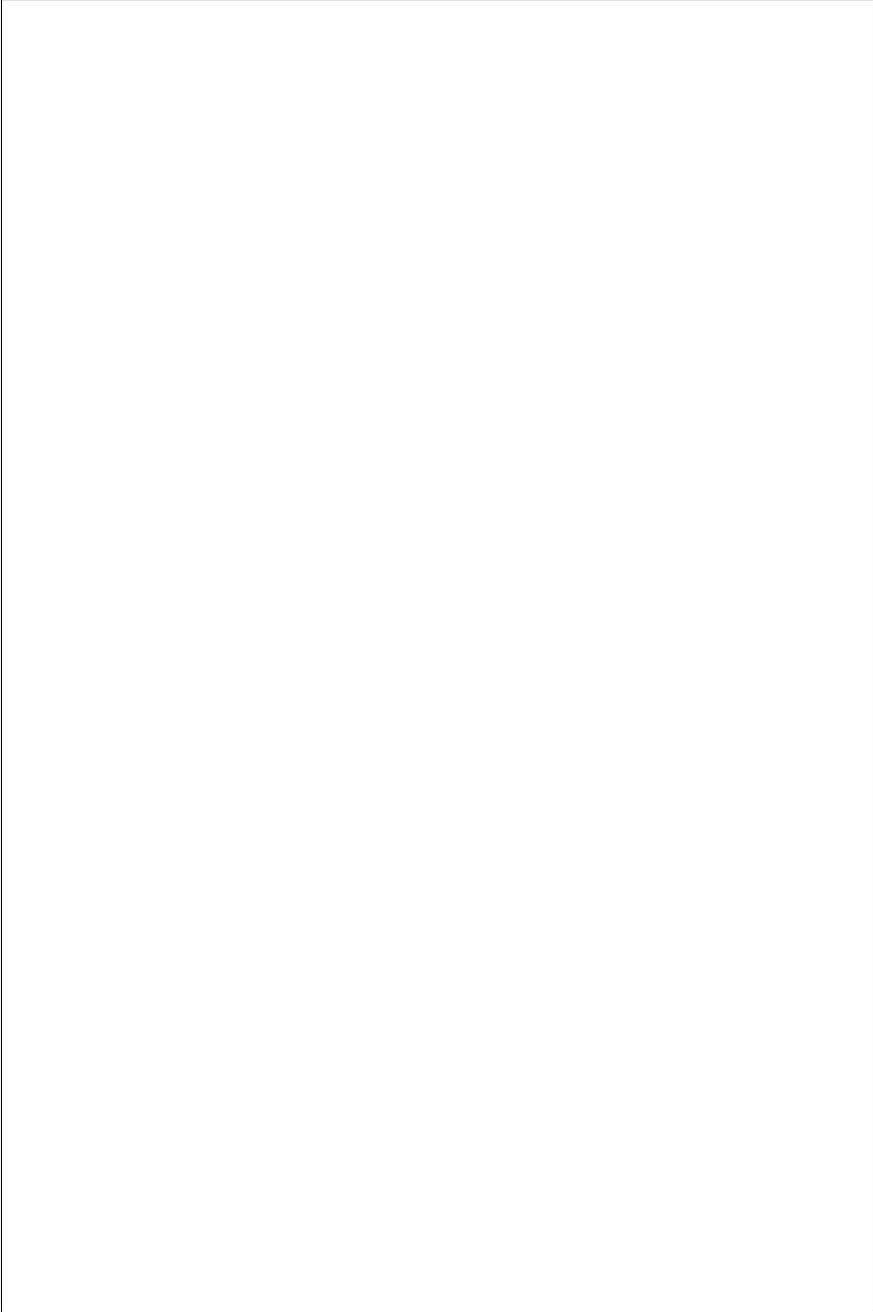
The impact of nonagricultural development—primarily rural enterprises—on agriculture is controversial. On one hand, the growth of TVEs in China has been described as “Lewisian industrialization” because it is driven by rural unemployment and does not conflict with agricultural growth by depleting agricultural labor force (Chang 1993). Further, subsidizing agriculture is an ordained duty of township and village enterprises according to the 1996 PRC Ordinance of Township and Village Enterprises (China TVE Yearbook 1997: 85). According to national statistics, a small fraction of the profits from rural enterprises was invested in agriculture: 7.78 billion yuan (about 13 percent of the total profits) in 1990, 8.65 billion (12.6 percent) in 1991, and 10.5 billion (10 percent) in 1992 went back to agriculture nationwide (Agricultural Bank of China 1993: 336). Rural industrialization may also benefit agriculture through the redistribution of income generated by farm and non-farm work. In some villages in Southern Jiangsu, for example, where the collective economy remains strong, farm and nonfarm jobs are paid about the same wage, a hidden form of agricultural subsidy (Wang *et al* 1995: 50).

On the other hand, the development of rural enterprises has adverse effects on agriculture. First, the construction of rural enterprises uses and abuses farmland. China has been losing her limited arable land at an alarming rate in the last decade due to the development of market towns, setting-up of rural enterprises, and construction of private housing (Orleans 1992; Lu 1995). Second, rural enterprises provide an alternative to back-breaking and not very rewarding agricultural activities. Fertile farmland is left uncultivated in relatively developed regions because peasants turn to nonfarm jobs (Lu 1995). Given the earnings differentials between farm and nonfarm work, peasants are drawn away from farming towards rural industry.

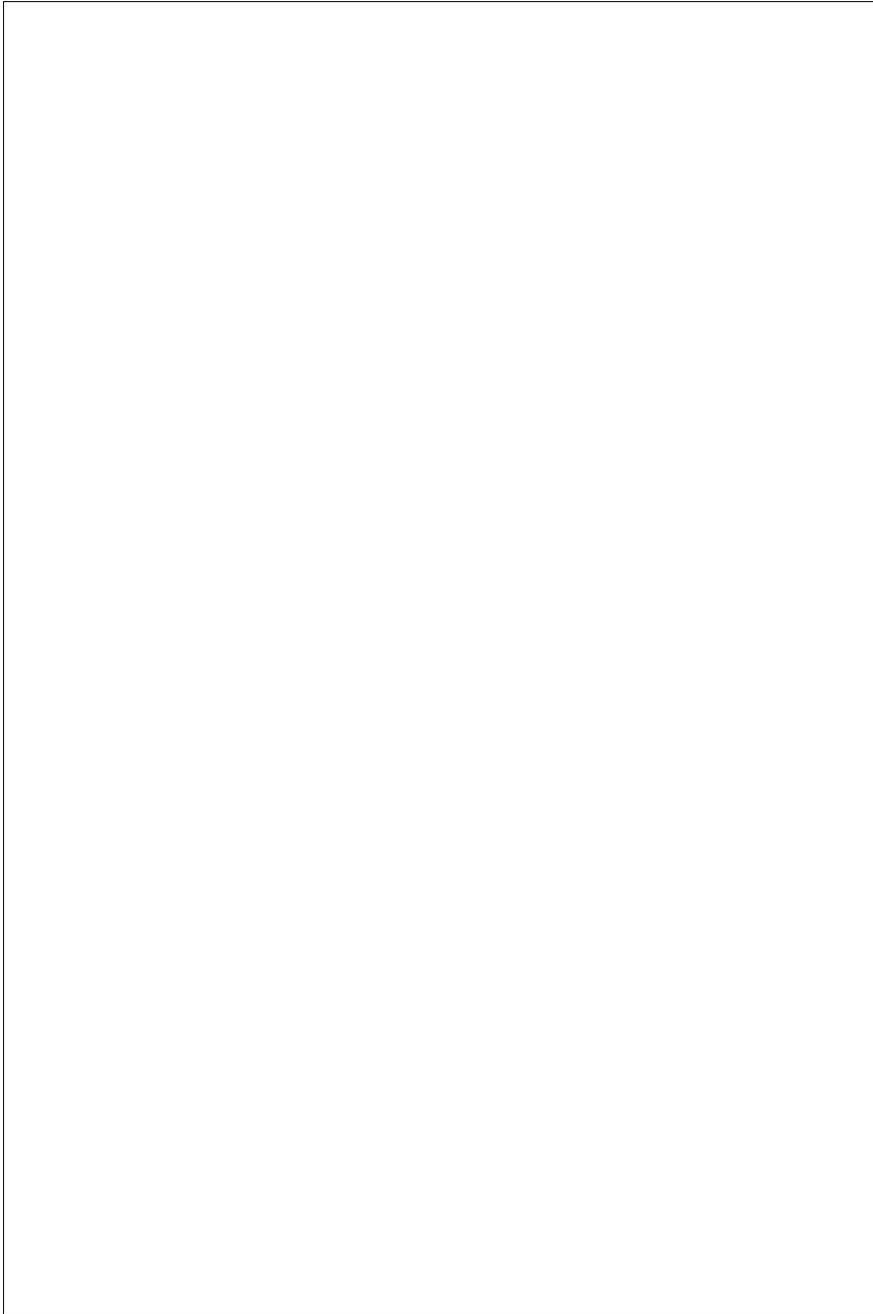
Knight and Song (1993: 198-9) find empirical evidence at the county level that agricultural production and nonagricultural production are mutually beneficial. Their parameter estimates, however, are counter-intuitive: 1 *yuan* increases in a county's agricultural output was expected to raise its nonagricultural output by 0.28 *yuan* whereas 1 *yuan* increase in nonagricultural output was expected to raise agricultural output by 1.9 *yuan*. Knight and Song explain that some of the correlation is spurious due to factors such as human capital and provincial government policies. I believe the problem with the Knight and Song analysis lies in their method: two-stage least square estimation of simultaneous effects without lagged endogenous variables is contingent upon the particular model specification. Because agricultural investment is much less profitable than nonagricultural investment (Sengupta and Lin 1993; Fleisher, Liu and Li 1996), I expect the investment in agriculture from nonagricultural savings to be limited, and the opposite flow of funds to be stronger. In other words, the effect of lagged agricultural output on nonagricultural growth should be stronger than the reserve effect of lagged nonagricultural output on agricultural growth.

Regions

A popular "escalator" theory divided China into three plateaus: eastern seaboard, middle region, and western highlands, corresponding to advanced, medium, and low levels of development (Wang *et al.* 1995). A recent World Bank study indicates that the coastal provinces and interior provinces are growing increasingly apart (World Bank 1997). Maps 1 and 2 display the per capita gross output value of agricultural and rural enterprises by province. The three provinces in the Northeast are known as China's grain basket. Xinjiang also has high agricultural output value



MAP 1. PER CAPITA GROSS OUTPUT VALUE OF FARMING, FORESTRY, ANIMAL HUSBANDRY AND FISHERY, CHINA, 1986



MAP 2. PER CAPITA GROSS OUTPUT VALUE OF RURAL ENTERPRISES, CHINA, 1996

because of its highly developed animal husbandry. Rural industry in China is disproportionately concentrated along the East Coast, especially around Yangtze River Delta (Shanghai, Jiangsu, and Zhejiang) and Pearl River Delta (Guangdong). With about one-sixth of the country's rural labor force, these regions account for over one-third of total rural industrial output calculated from State Statistical Bureau (1996: 354, 389).

Popular though the "escalator" theory may be, it does not explain the specific factors which make the coastal regions grow faster. I argue that the observed gaps between coastal and noncoastal regions should be largely explained by the variables considered above: human capital stock, land and labor endowments, and the level of urbanization. I still include regions in my analysis in order to capture residual effects such as easy access to foreign trade with its "open" cities (Fan 1992), and government preferential policies (Yang and Wei 1996).

DATA, VARIABLES, AND METHOD

Knight and Song (1993) argue that the county should be an appropriate unit of analysis because every county behaves like a little kingdom. There are about 2,300 counties and county-level cities in China. In 1991, the average population size of a county was about 474,000; the median population size was 392,000. The largest county had an end-year population slightly over 2 million and the smallest county about 7,500 people.

The county-level data used in this study come from four sources. (1) A survey of counties as of 1991 which were conducted jointly by the State Statistical Bureau and the Chinese Academy of Social Sciences (1992) for the purpose of evaluating affluent counties (*xiaokang xian*). (2) Historical output data drawn from *Zhongguo Fenxian Nongcun Jingji Tongji Gaiyao (Summary Statistics of Rural Economy of Chinese Counties)* (State Statistical Bureau 1989, 1991, 1993). (3) Geographical data of counties collected from *Encyclopedia of Chinese Counties Vol. 1-6* (Ministry of Civil Administration 1992). (4) Geographical data of 195 cities of district level or above (including Hong Kong and Macau) from *Statistical Yearbook of Chinese Cities* (State Statistical Bureau 1992) and Chen and Wang (1991). Information about cities is used for estimating urban proximity of the counties.

The 1992 survey of affluent counties collected 1991 data for 2,044 counties (including county-level cities) from 24 provinces (missing Liaoning, Hainan, and Tibet) and the three metropolitans (Beijing, Shanghai, and Tianjin). 123 counties from two provinces (Inner Mongolia and Qinghai) are excluded from the analysis because of poor data quality, and another 38 counties are

excluded due to missing values, outliers, or internally inconsistent data. This results in a clean sample of 1,883 counties for the empirical analysis.

Unless specified otherwise, each of the following variables was taken either from the survey of affluent counties for 1991 data or from *Summary Statistics of Rural Economy of Chinese Counties vol. 1980-1987*, and *vol. 1989* for 1985, 1987, and 1989 data.

Rural population is the year-end total number of people who are registered as rural residents in the specified county (excluding those with urban registration). All *per capita* output values are divided by this variable.

Peasant net income is the annual net income of peasant households in cash and kind. This indicator is generated by a long-term household sample survey of Chinese households organized by the State Statistical Bureau and collected in the affluent county survey.

Agricultural output is the gross output value of farming, forestry, animal husbandry, fishery, and household sidelines in a county. In 1991 Chinese statistical office re-categorized household sidelines (hunting, gathering, and some handicrafts) into farming.

Nonagricultural output is the gross output value from individual households or enterprises in industry, construction, transportation, commerce and catering in a specific county. This figure is obtained by subtracting agricultural output from the gross output of rural society.⁷

Human capital stock is measured as the proportion of people with at least junior high school or equivalent education in the whole population of the county. Peng (1992) and Gelb (1990) report that junior high school education brings the highest return in wages to TVE employees.

Farmland is the total amount of farmland in *mu* in a specified county (from State Statistical Bureau 1993).

Rural labor force is the total number of able-bodied peasants in a county, including those who are registered as local residents but work and probably live outside of the county, and excluding those who work inside the county but do not have local registration (from the survey of affluent counties). Note that this is a measure of local labor supply rather than actual labor input.

Urban proximity index is computed as the sum of the ratios of urban population over distances from the 195 district or provincial level cities, including Hong Kong and Macau, according to the formula used by

⁷ The gross output value of rural society is the sum of the gross output value of agriculture, industry, construction, transportation and postal services, and commerce (including food catering but excluding financial and legal services).

Steward and Warntz (1958). Distances are the arc distance of each county from each of the 195 cities, computed from their geographic coordinates using the standard formula from Robinson *et al.* (1995: 50). Geographic coordinates of counties are taken from *Encyclopedia of Chinese Counties Vol. 1-6* and those of cities from Chen and Wang (1990). Urban population includes only the “entitled” population with urban registration, taken from *Statistical Yearbook of Chinese Cities 1992* (State Statistical Bureau 1992). This index was standardized by subtracting the mean and dividing by the standard deviation.⁸

Regions represent Chinese provinces divided into (1) **coastal**, including Beijing, Tianjin, Shanghai, Heilongjiang, Jilin, Hebei, Shandong, Jiangsu, Zhejiang, Fujian, Guangdong, Guangxi, Hainan, (2) **central**, including Henan, Anhui, Jiangxi, Hubei, Hunan, and Shanxi, and (3) **western**, including Sichuan, Guizhou, Yunnan, Shaanxi, Gansu, Ningxia, and Xinjiang.

Methodological Design

To examine how human capital stock, urban proximity, and other variables affect the net income of peasants via agricultural and nonagricultural production, I estimate equation systems in the following form:

$$\ln(I) = \alpha_1 \ln(A) + \alpha_2 \ln(N) + \varepsilon_1, \tag{1}$$

$$\begin{aligned} \ln(A) = & \beta_1 E + \beta_2 U + \beta_3 \ln(F) + \beta_4 \ln(L) + \beta_5 \ln(A_{85}) + \beta_6 \ln(N_{85}) \\ & + \beta_7 (ER) + \beta_8 (CR) + \varepsilon_2, \end{aligned} \tag{2}$$

$$\begin{aligned} \ln(N) = & \gamma_1 E + \gamma_2 U + \gamma_3 \ln(F) + \gamma_4 \ln(L) + \gamma_5 \ln(A_{85}) + \gamma_6 \ln(N_{85}) \\ & + \gamma_7 (ER) + \gamma_8 (CR) + \varepsilon_2, \end{aligned} \tag{3}$$

where “ $\ln(I)$ ” stands for the log of net peasant household income per capita; “ A ” for agricultural output per capita; “ N ” for nonagricultural output per capita; “ E ” for percent of people in the county with at least junior high schooling; “ U ” for urban proximity index; “ F ” for farmland *per capita*; “ L ” for rural labor force; “ ER ” for Eastern coastal regions; and “ CR ” for central regions. Equations (2) and (3) are estimated both with and without the lagged (1985) output variables A_{85} and N_{85} . When the lagged dependent variables are controlled, the regression coefficients in (2) and (3) indicate the effects of exogenous factors on the agricultural and nonagricultural growth

⁸ I thank William Parish for suggesting and providing reference for this measure.

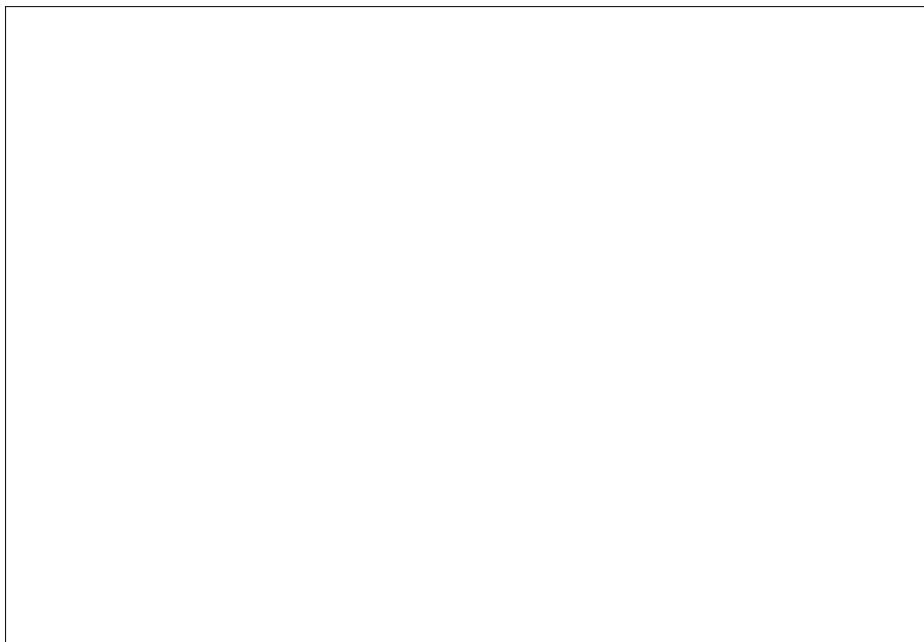


FIGURE 3. CUMULATIVE SHARES OF NET INCOME, AGRICULTURAL OUTPUT AND NONAGRICULTURAL OUTPUT SORTED BY COUNTY AVERAGES (CHINA, 1991; N=1, 883 COUNTIES)

rates from 1985 to 1991. The error terms in (2) and (3) are allowed to correlate with each other. Maximum likelihood estimation results are obtained using LISREL 8.

ANALYSIS

Before presenting the regression results, I will first compare the cumulative distribution of peasant net income, agricultural output value and nonagricultural output value in figure 2. Analogous to the Lorenz curve, figure 2 is created by first sorting the counties in ascending order by per capita gross output values (or income) and then computing the cumulative shares of total output values (or income). Apparently, nonagricultural output is much more unevenly distributed than agricultural output. The top 10 percent of the counties produced about half of the total nonagricultural output in 1991 whereas the bottom 50 percent of the counties produced only little more than ten percent of the total nonagricultural output. On the other hand, agricultural output is much

TABLE 1A. MAXIMUM LIKELIHOOD REGRESSION ANALYSIS OF LOGGED PEASANT NET INCOME ON LOGGED *PER CAPITA* AGRICULTURAL AND NON AGRICULTURAL OUTPUT (CHINA, 1991; N=1, 883 COUNTIES).

	Logged <i>per capita</i> peasant net income (1)	Logged <i>per capita</i> agricultural output (2)	Logged <i>per capita</i> non-agricultural output (3)
<i>MULTIPLE R</i> ²	0.718	0.294	0.659
Logged <i>per capita</i> agricultural output (1991)	0.503*** (38.3)	-	-
Logged <i>per capita</i> nonagricultural output (1991)	0.190*** (33.8)	-	-
Urban proximity index		-0.054*** (-4.47)	0.466*** (23.8)
Percent with junior-high schooling		0.10*** (17.5)	0.059*** (33.1)
Logged farmland <i>per capita</i> (<i>mu</i>)		0.082*** (4.48)	-0.109*** (3.66)
Logged rural labor force <i>per capita</i>		0.160** (2.76)	0.534*** (5.66)
Coastal Provinces		0.330*** (12.0)	0.195*** (4.34)
Central Provinces		0.023 (0.82)	-0.058 (1.28)

Notes: (a) The three equations are estimated simultaneously in LISREL 8. The error terms of (2) and (3) are allowed to correlate, with correlation coefficient=0.186, significant. With 6 degrees of freedom, the total model Chi-square is 172.

(b) Figures in the parentheses are t-ratios. * indicates significance at 0.05; ** 0.01; *** 0.001.

TABLE 1B. PATH ANALYSIS OF THE EFFECTS OF EDUCATION, URBAN PROXIMITY, THE LAND-LABOR RATIO AND REGIONS ON PEASANT NET INCOME (CHINA, 1991; N=1,883 COUNTIES).

	Via agriculture	Via non- agriculture	Total
Urban proximity index	-0.027	0.089	0.061
Percent with junior-high schooling	0.010	0.011	0.021
Logged farmland <i>per capita</i> (<i>mu</i>)	0.041	-0.021	0.021
Logged rural labor force <i>per capita</i>	0.080	0.101	0.182
Coastal Provinces	0.166	0.037	0.203
Central Provinces	0.012	-0.011	0.001

more evenly distributed across counties. The top 10 percent of the agriculture-rich counties produced only about 15 percent of the total

TABLE 2A. MAXIMUM LIKELIHOOD REGRESSION ANALYSIS OF LOGGED PEASANT NET INCOME ON LOGGED *PER CAPITA* AGRICULTURAL AND NON-AGRICULTURAL OUTPUT (CHINA, 1991; N=1,883 COUNTIES).

	Logged <i>per capita</i> peasant net income (1)	Logged <i>per capita</i> agricultural output (2)	Logged <i>per capita</i> non-agricultural output (3)
<i>MULTIPLE R</i> ²	0.718	0.693	0.833
Logged <i>per capita</i> agricultural output (1991)	0.503*** (38.2)	-	-
Logged <i>per capita</i> nonagricultural output (1991)	0.190*** (33.8)	-	-
Urban proximity index		-0.068*** (7.69)	0.212 (13.9)
Percent with junior-high schooling		0.0047*** (5.36)	0.021*** (13.9)
Logged farmland <i>per capita</i> (<i>mu</i>)		-0.017 (1.35)	-0.096*** (4.52)
Logged rural labor force <i>per capita</i>		-0.093* (2.39)	0.063 (.94)
Logged <i>per capita</i> agricultural output (1985)		0.825*** (44.4)	0.184 (5.70)
Logged <i>per capita</i> nonagricultural output (1985)		0.061*** (5.95)	0.703*** (39.5)
Coastal Provinces		0.112*** (5.98)	0.122*** (3.77)
Central Provinces		-0.081*** (4.40)	-0.074* (2.32)

Notes: (a) The three equations are estimated simultaneously in LISREL 8. The error terms of (2) and (3) are allowed to correlate. The correlation coefficient is 0.176, significant. With 8 degrees of freedom, the total model Chi-square is 223.

(b) Figures in the parentheses are t-ratios. * indicates significance at 0.05; ** 0.01; *** 0.001.

agricultural output whereas the bottom 50 percent of the agriculture-poor counties accounted for 35 percent of the total. The income curve falls between the agricultural curve and the nonagricultural curve, suggesting that nonagricultural income constitutes a new source of income inequality.

I will now examine the extent to which variations in agricultural and nonagricultural output are reflected in peasant net income and how income returns to various factor endowments materialize via agricultural and nonagricultural activities. Table 1a presents the estimation results of the equation system which does not control for the lagged agricultural and nonagricultural output.

TABLE 2B. PATH ANALYSIS OF THE EFFECTS OF EDUCATION, URBAN PROXIMITY, THE LAND-LABOR RATIO AND REGIONS ON PEASANT NET INCOME (CHINA, 1991; N=1,883 COUNTIES).

	Via agriculture	Via non-agriculture	Total
Urban proximity index	-0.034	0.040	0.006
Percent with junior-high schooling	0.002	0.004	0.006
Logged farmland <i>per capita</i> (<i>mu</i>)	-0.009	-0.018	-0.027
Logged rural labor force <i>per capita</i>	-0.047	0.012	-0.035
Logged <i>per capita</i> agricultural output (1985)	0.415	0.035	0.450
Logged <i>per capita</i> nonagricultural output (1985)	0.031	0.134	0.164
Coastal Provinces	0.056	0.023	0.080
Central Provinces	-0.041	-0.014	-0.055

According to equation (1) in Table 1a, 72 percent of the county-level variance of logged peasant net income *per capita* is explained by logged agricultural output *per capita* and logged nonagricultural output *per capita*. Let *lnI* be the logged peasant income; *lnA* the logged agricultural output; and *lnN* the logged nonagricultural output. Then,

$$lnI = \beta_0 + 0.503lnA + 0.190 lnN + \varepsilon_1, \tag{4}$$

where β_0 is the constant not estimated by LISREL. A doubling in *per capita* agricultural output corresponds to a 42 percent [$\approx 2^{.503} - 1$] increase in peasant net income. A doubling in *per capita* rural industrial output corresponds to a 14 percent increase in peasant net income. Agricultural profits may be more directly reflected in peasant net income because agriculture is primarily household production. The net output value of rural enterprises includes collective income, wages for migrant workers, and local peasant income. A large part of TVE profits will be used for reinvestment and TVE expansion or as government expenditure in various public facilities and services. Therefore only a small portion is reflected in personal income.

The unique and joint contributions to income inequality by agricultural and nonagricultural components can be examined by dissecting the variance of logged net income into its components (variance and covariance data are presented in Appendix).

$$\begin{aligned} Var(lnI) &= Var(\beta_0 + \beta_1 lnA + \beta_2 lnN + \varepsilon_1) \\ &= \beta_1^2 Var(lnA) + \beta_2^2 Var(lnN) + 2\beta_1\beta_2 Cov(lnN, lnA) + Var(\varepsilon_1). \end{aligned} \tag{5}$$

$$\text{Or } 0.185 = 0.051 + 0.040 + 0.042 + 0.052.$$

In other word, agricultural output accounts for 28 percent of the total variance in logged peasant income; nonagricultural output 21 percent; agricultural and nonagricultural output jointly produced another 23 percent; and the remaining 28 percent are unexplained. Even though nonagricultural output accounts for a larger share in the Gini-coefficient in total output (Rozelle 1994), agriculture is still the dominant component in local peasant income inequality, because only a small part of nonagricultural output is translated into peasant income. Nevertheless, nonagricultural activities constitute an important disequalizing factor in rural income. Because it correlates positively with agriculture, it accentuates the impact of agricultural disparities on personal income inequality.

Determinants of Agricultural and Nonagricultural Output

Rural nonagricultural development increases income inequality by raising returns to human capital, labor, and urban economic spillovers. According to equations (2) and (3) in table 1a, the urban proximity index has a large positive effect on nonagricultural output, consistent with the argument that urban economic spillovers agglomerate rural enterprises around cities. An increase of one standard deviation in the urban proximity index raises nonagricultural output per capita by nearly 60 percent. On the other hand, urban proximity has a small but significant **negative** impact on agriculture: one standard deviation above the mean decreases agricultural output by 5 percent. When the lagged (1985) agricultural and nonagricultural output is controlled a change of, one standard deviation in the urban proximity index raises nonagricultural output by 24 percent and decreases agricultural output by 7 percent (Table 2b). I interpret this negative sign as reflective of the fact that urban expansion suppresses agriculture by raising the market value of the farmland and increasing opportunity costs to labor.

Nonagricultural activities offer a much higher return to human capital stock than do agricultural activities. For example, a 10 percent increase in the proportion of people with at least junior-high school education corresponds to an 80 percent increase [$\approx e^{.59}-1$] in nonagricultural output *per capita*, an increase of only 21 percent in per capita agricultural output. Controlling for the lagged agricultural and nonagricultural output reduces the effect of human capital on agricultural and nonagricultural output to 23 percent and 5 percent respectively (Table 2a). These should be interpreted as

the effect on output growth rate from 1985 to 1991.

As predicted, *per capita* logged farmland has a significant negative coefficient on nonagricultural production (Table 1a). Controlling for the lagged dependent variables only slightly reduces the size of the coefficient (Table 2a). In other words, the shortage of farmland motivates rural nonagricultural activities. For example, Heilongjiang, a province in China's northeastern corner and most endowed in fertile farmland in the country, has about ten times the country's average of farmland *per capita*. This factor alone would slow down its rural industrial development by more than 20 percent below average, other things equal (equation 3, Table 1a). This province does lag behind in the country's drive for rural industrialization. Not surprisingly, farmland has a positive impact on the level of agricultural output (Table 1a), but does not seem to raise the agricultural growth rate from 1985 to 1991 (Table 2a).

Nonagricultural activities also offer a much higher return to local labor supply. Holding the amount of farmland constant, a doubling in rural labor supply is expected to raise a county's agricultural output *per capita* by 12 percent [$\approx 2^{.16}-1$] and nonagricultural output by 45 percent (Table 1a).⁹ An abundant supply of labor, however, does not seem to be a favorable factor in agricultural and nonagricultural growth rates (Table 2a).

Net of other factors, coastal provinces still enjoy some advantages in agricultural and nonagricultural production over western provinces, with agricultural output per capita 39 percent higher and nonagricultural output per capita 22 percent higher than the latter (Table 1a). Central provinces do not seem to have any significant net advantage over western provinces. Particularly with regard to nonagricultural output, the regional differentials are much less than the "escalator" theory would predict or Map 2 would indicate. This suggests that the observed regional differences in nonagricultural development are largely captured by the factors considered here.

As anticipated, agricultural production and nonagricultural production are mutually beneficial, with the effect of lagged agricultural output on nonagricultural output stronger than the reciprocal effect (Table 2a). For example, a doubling of 1985 agricultural output is expected to increase 1991 nonagricultural output by 13 percent [$\approx 2^{.184}-1$], holding 1985

⁹ Note that the variable is total local labor supply rather than actual labor input into agricultural and nonagricultural production. Nevertheless, these results still suggest that given the overall shortage of farmland, marginal returns to labor are still declining and that the diseconomy of scale still dominates Chinese countryside. The nonagricultural development alleviated but did not solve the problem.

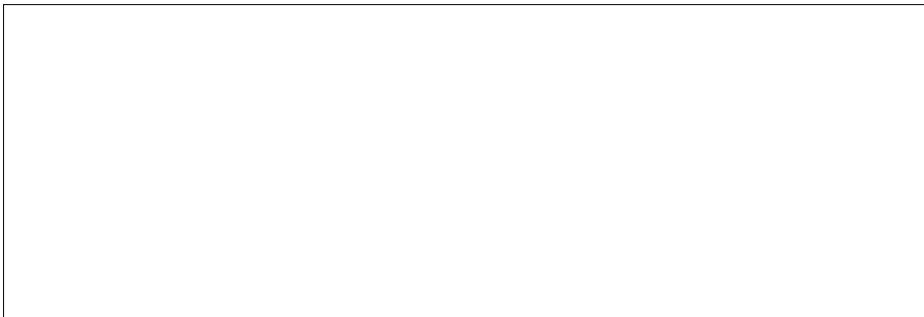


FIGURE 4. A PATH DIAGRAM OF PEASANT NET INCOME, CONTROLLING FOR REGION (EASTERN, CENTRAL, AND WESTERN), CHINA, 1991; N=1,883 COUNTIES.

nonagricultural output constant. Conversely, a doubling in 1985 nonagricultural output is expected to raise 1991 agricultural output by 4 percent [$\approx 2^{.061}-1$], holding 1985 agricultural output constant.

Path Analysis

If peasant income is the end product, then the exogenous variables, education, farmland, labor, urban proximity index are the inputs. Agricultural and nonagricultural activities are intervening mechanisms that turn the inputs into output—peasant income. Therefore, regional income disparities ultimately should be traced to regional disparities in these exogenous factors, which influence peasant incomes via two paths: agricultural and nonagricultural. Figure 4 presents a path diagram illustrating the connection between local factor endowments and peasant net income via the agricultural and nonagricultural paths.

Table 1b summarizes the effects of the exogenous factors on income via the agricultural path and the nonagricultural path. A change of one standard deviation in the urban proximity index would decrease peasant net income by 3 percent via agriculture and increase it by 9 percent via nonagricultural activities, with a net gain of 6 percent. A 10 percent increase in the proportion of people with junior high school education would increase a county's personal income by 11 percent via agriculture and 12 percent via nonagricultural path. A doubling in the land-population ratio would increase peasant income by 3 percent via its positive effect on agriculture while decreasing it by 1.5 percent via its negative effect on nonagricultural activities, yielding an insignificant net gain of 1.5 percent. Farmland is usually believed to be the most valuable asset for peasants.

Given the low profitability of farming in contemporary China, however, the returns to farmland are diminished, echoing Chinese peasant wisdom which says, “no industry, no wealth (*wu gong bu fu*).”

Per capita rural labor (labor-population ratio) reflects a county's local labor supply. Other things equal, a doubling in labor supply is expected to increase peasant net income by 6 percent via agricultural activities and 7 percent via nonagricultural activities. Even allowing for the fact that a large share of the TVE profits goes to public spending, income returns to rural labor (supply) are still very low.

SUMMARY

Rural industrialization is the most remarkable, albeit unexpected, achievement of Chinese agricultural reform since 1978. Huang (1990) argues that the recent rural industrialization in China has created a possibility for truly transformative development. The data in this study suggest that at the current stage it is primarily the immediate hinterland of the urban centers that are being transformed while a vast majority of rural areas remain agrarian.

This paper has examined the agricultural and nonagricultural contribution to the spatial inequality of peasant income through analyzing their differential returns to mass education, rural labor supply, farmland, and urban proximity. First, agriculture is much more closely linked with peasant household income than is rural industry. A large proportion of profits from township and village enterprises (TVEs) is used for reinvestment or public spending on such projects as schools, hospitals, wide and well-lit streets, glamorous government office buildings and expensive imported cars. Therefore, even though nonagriculture produced a larger share of rural GDP than does agriculture, it still accounts for a smaller share in peasant income.

Rural industrialization enhances the income returns to human capital. Consistent with human capital theory and contrary to credentialing theory, the proportion of junior-high school graduates in the population has a strong impact on the development of rural enterprises and a weaker but unequivocal impact on agricultural income. Supporting Nee's (1989, 1996) thesis that market transition enhances income returns to education, the current study finds that enhanced returns are captured by nonagricultural activities. Chinese government's long-time campaigns for reducing illiteracy and providing mass education to peasants seem to pay off handsomely in unexpected rural industrialization.

APPENDIX. VARIANCE AND COVARIANCE MATRIX OF VARIABLES USED IN THE REGRESSION ANALYSIS
(CHINA, 1991; N=1,883 COUNTIES)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Logged rural net income per capita	0.185										
Logged agricultural output per capita	0.143	0.203									
Logged rural nonagricultural output per capita	0.321	0.217	1.118								
Urban proximity index	0.141	0.043	0.698	1							
% of junior-high school graduates	0.021	0.018	0.062	0.031	0.008						
Logged farmland per capita	-0.017	0.061	-0.062	-0.125	0.012	0.405					
Logged rural labor force per capita	0.007	-0.012	0.032	0.045	-0.003	-0.078	0.041				
Central regions	0.064	0.077	0.132	0.108	0.008	0.036	-0.016	0.213			
Coastal regions	0.008	-0.027	0.114	0.182	0.009	-0.066	0.008	-0.108	0.228		
Logged agricultural output per capita	0.105	0.138	0.194	0.081	0.015	0.048	-0.006	0.052	0.005	0.146	
Logged rural nonagricultural output per capita	0.264	0.172	0.854	0.557	0.052	-0.051	0.031	0.076	0.113	0.166	0.838

Necessitated by the declining labor productivity, rural nonagricultural development improves marginal returns to local labor supply. Because the abundance of farmland impedes nonagricultural development, farmland became a less important differentiating factor of rural income during the post-reform era. China's rural industrialization at the current stage is driven by the dynamics of extensive growth. Extensive industrialization is achieved primarily through increasing labor input. China's rural industrialization is fueled by a huge "underlanded" peasantry and has a long way to go before it exhausts this fuel source.

Urban proximity has a strong impact on rural nonagricultural output, reflecting the benefits of technological and possibly capital spillovers and easy access to urban markets. Overall, proximity to cities brings only limited benefit to peasant income. First, only a small proportion of value added by nonagricultural activities is reflected in peasant household income. Second, that benefit is further reduced by the loss of agricultural income. Still, the peasants in the vicinity of cities may enjoy a better standard of living because of public facilities (schools, hospitals, cinemas etc.) provided by TVE profits.

Agricultural growth and nonagricultural growth appear to be mutually beneficial. Past agricultural savings show strong effects on nonagricultural growth, probably by providing initial startup capital for TVE investment and by enlarging local consumer markets. Lagged nonagricultural output shows a weak positive effect on agricultural growth, reflecting subsidizing agriculture with rural industry.

Yangtzi River Delta and Pearl River Delta regions are close to large cities (Shanghai and Hong Kong), densely populated, and have a well-educated labor force. Therefore, these regions lead the country in the development of rural enterprises, resulting in diverging income gaps between coastal and interior provinces.

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YUSHENG PENG received his Master’s degree in sociology from Beijing University and his Ph.D. in sociology from the University of California at Los Angeles. He is at present an assistant professor at the Chinese University of Hong Kong, teaching statistics, methodology and Chinese studies. His research interests include economic institutions and social stratification. He has published “Wage Determination in Rural and Urban China: A Comparison between Public and Private Sectors” (1992) and (co-authored) “Collaboration Structure and Information Dilemmas in Biotechnology: Organizational Boundaries as Trust Production” (1996).