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Abstract. Economic reform and restructuring in China have resulted in substantial changes in how farmers earn their livings and how much they earn. Based on a neoclassical model of economic development and structural change as interpreted by Oshima (1983) for East Asia, we hypothesize that farmers in Jiangsu Province earn greater incomes from off-farm jobs associated with nearby cities and urban market centers. This income pattern, we believe, results in distinctive household types associated with specific employment and economic activities of family members and reflects a sequence of change in the farm economy suggestive in part of the farm evolution model posed by Weitz (1971).

A 167-farm-family sample was surveyed in four agricultural regions in Jiangsu in 1986–87. Sample data identified sources of family income and determined the significance of activity types and proximity to cities for family income. Variables of income, farm, and family size were cross-correlated to determine those with the most significant effects on total family income. Using principal components analysis and cluster analysis, we identified three household types based on income sources: traditional agricultural, mixed, and industrially focused. Farmers closest to the large city of Suzhou were the most prosperous, with incomes derived largely from industrial employment, while farmers in more remote locations appeared most traditional, earning a larger share of their income from field cultivation. While location is believed significant in the processes of economic change, its role cannot be specified based on currently available data.

T HE rural economy in China has been changing rapidly in recent years as a result of reforms initiated in late 1978 (Lardy 1986; Xue 1986; Chow 1987). An essential element of these reforms is the transfer of land under contracts to farm families for long periods. This approach is markedly different from that of the commune system, wherein the state controlled all use of rural land, although peasants were allowed to farm small private plots. Under the new system, families typically have quotas for the production of food grain at guaranteed state prices, with higher incentive prices for producing above the quota. Families are also allowed to market surplus commodities on their own and to determine how they allocate investment resources and other inputs to their contracted land (Travers 1984; Crook 1986).

A very complex set of farming arrangements has resulted in which farm families seek to increase their incomes, usually by means other than farming, while complying with the state rules established to insure a continuing, reliable output of food grain. Since the monetary rewards for growing food grain are generally considerably less than for other crops or sideline activities such as swine, fowl, or fish production (Han 1988), families have focused more on cash crops or other activities, including jobs in village or township collective industries, to increase their incomes. The families try to meet food grain quotas by minimizing labor input, thus freeing themselves to increase their in-
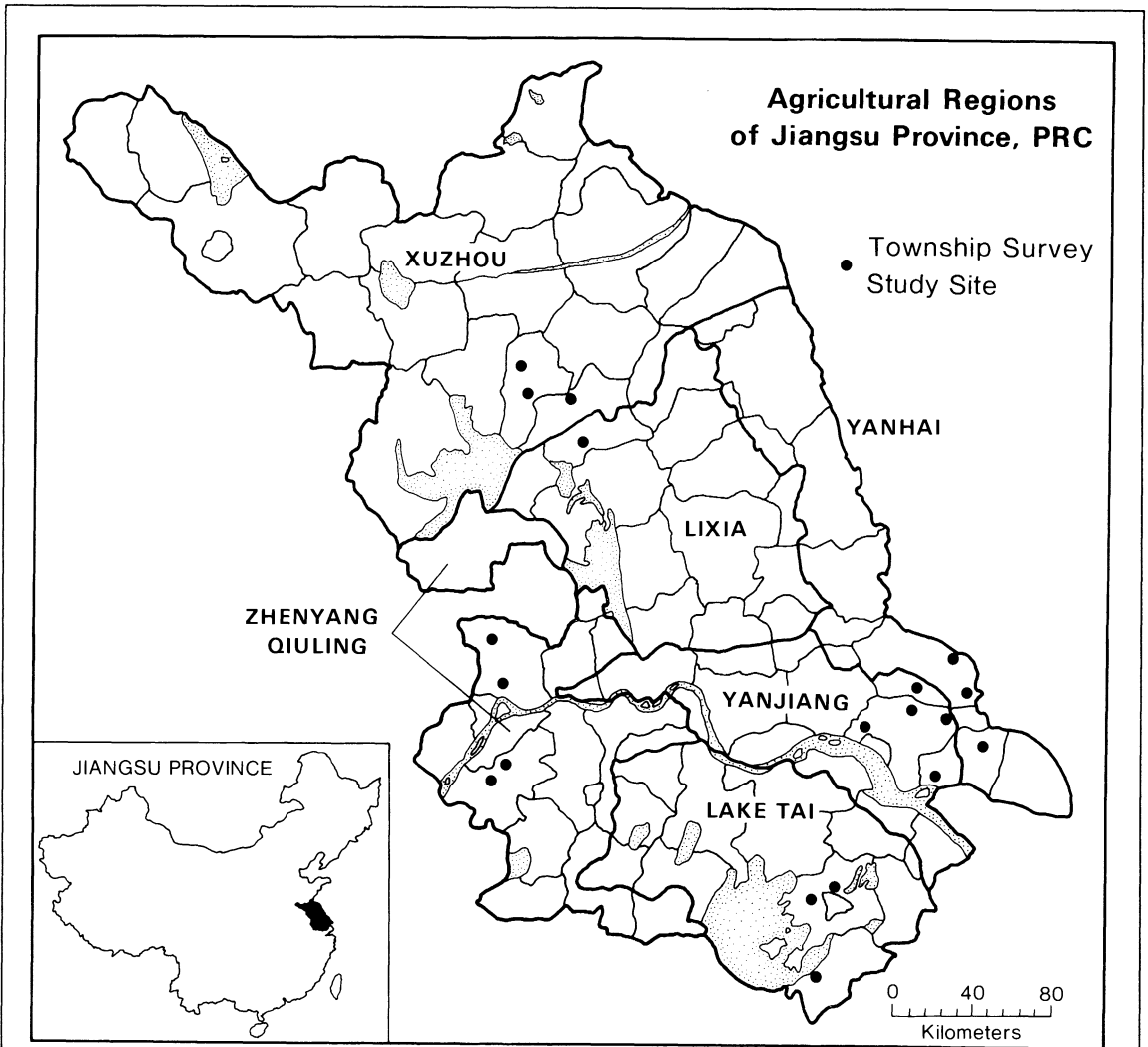
Figure 1. Agricultural regions of Jiangsu Province. Study sites in eight counties where sample surveys were conducted are indicated with black circles.

comes through the other activities (Oi 1986; Travers 1986; Cheng 1987). Problems, however, have emerged. For example, farm output grew rapidly between 1978 and 1984, but food grain production has tapered off since 1984, due in part to stagnating agricultural investment. Chinese policy makers appear to be debating which policies are most efficacious in improving rural incomes from agricultural production while insuring a sufficient supply of food grain and minimizing the costs of farming (Liu et al.

1987, 161–68; Sunan jianwei . . . 1988). Moreover, there appear to be some regional variations in the complex patterns of farming, output growth and improvements in farming efficiency. Among the places in China where this rural restructuring has advanced rapidly is Jiangsu Province and especially its southern third (the Sunan region), with its favorable agricultural environment, well-developed transportation system and well-integrated network of cities and towns (Fig. 1).

Purpose and Goals

This paper describes and analyzes the effects of these reforms on farm-family income in eight counties located in four agricultural regions of Jiangsu Province (Fig. 1). Specifically, it will attempt to describe the sources of income for the families and to analyze the most important factors in determining the evolving patterns of family income. We also seek to identify and explain locational patterns associated with how farm families in these different regions and counties of Jiangsu earn their livings. Income data for the study were derived from interviews with members of 167 farm families in the studied areas during 1986–87.

An examination and analysis of how Jiangsu farmers are currently deriving their income may cast some new light on the above questions, and some new insight may be achieved into the structural and locational patterns of agricultural development and commercialization in one of China's leading regions of economic growth.

Changes occurring in the study areas involve several key aspects of the multifaceted rural economy—crop production, sideline activities, labor input and the increasing links to rural industries and to markets in adjacent towns and cities (Table 1). Viewed broadly, the key questions we seek to answer are: (1) how do farmers earn their incomes in the study areas of Jiangsu? (2) what is the effect of economic restructuring on how these farmers earn their livings? (3) what role, if any, does location have in explaining patterns of farm family income? and (4) how do the processes of structural shift and rising productivity of farm labor in southern Jiangsu accord with the theoretical explanations of economic modernization in East Asia as Oshima (1983) has expressed them?

The Modernization and Economic Restructuring of Socialist China: Some Theoretical Concerns

China is in the process of rapid change and economic experimentation. The extremes of central planning and regional autarchy have been abandoned, at least temporarily. Market approaches to economic growth are being used increasingly, especially in the rural sector. From a theoretical perspective, we argue that recent economic restructuring represents some modification of strict socialism based on central planning in favor of policies at least partially associated with the neoclassical structural change models as described by Lewis (1955), Fei and Ranis (1964), elaborated by Chenery and Syrquin (1975) and Chenery (1979), and summarized for East Asia by Oshima (1983). In these models, structural change in the economic system is characterized by a shift in employment share from agriculture to industry (the modern urban sector), with a concomitant increase in wages and possible spatial shift of rural workers to an urban or peri-urban location. Sectoral shifts in contribution to national output or income also occur as agriculture's share declines and industry's share increases. According to Chenery (1979), the point at which these two sectors have equal income shares represents an important shift in development between early and transitional stages of structural change. This usually occurs when a country's per-capita GNP reaches $600. Chenery's empirical work also disclosed that where such structural shifts were occurring and industrialization and urbanization were increasing rapidly, the distribution of income was becoming more inegalitarian. For China these models may not be entirely appropriate, but they offer a useful gauge for analysis and comparison, especially since Chenery's findings are based on empirical investigation of Third World cases.

The special challenge of development for China is how to deal with labor absorption of rural workers (Fei 1983). A structural shift in sectoral output and employment share indicates many farm workers will shift to industrial or perhaps service activities. Yet how will this process occur, since China has such a large population and a large rural work force? Population growth, while moderating, nonetheless adds about 15 million people each year, maintaining enormous pressure for employment growth. Can the industrial or urban-based service sectors absorb large numbers, both of current farm workers, who wish to increase their incomes by shifting to off-farm jobs, and of new workers, who enter the labor force each year through population growth?

Oshima (1983) has provided a useful synthesis of a theoretical model of structural shift, commercialization of farm economies and demo-

Table 1. Labor in Four Rural Prefectures by Employment Sector, 1985[a]

Location	Total population	Total workforce	Agriculture	Forestry, fisheries, husbandry, sideline	Industry	Construction
Jiangsu	51,530	25,992	15,228 (58)	1812 (7)	4756 (17)	1502 (6)
Nantong Prefecture	6648	3950	2094 (53)	333 (8)	700 (17)	331 (8)
Nanjing Prefecture	2520	1217	672 (51)	106 (9)	277 (23)	66 (5)
Suzhou Prefecture	4230	2692	1035 (38)	221 (8)	1027 (38)	144 (5)
Huaiyin Prefecture	8074	3528	2822 (80)	223 (6)	146 (4)	97 (3)

[a] In 1000s; percentage in parentheses.
Source: Editorial Committee, 1987, III-17.

graphic change that occurred in Japan, Taiwan, and South Korea. In this model the rate of growth in the per-capita output of farm workers exceeded growth in the labor force; at the same time overall farm output and yields grew. Farm wages also increased. This rural prosperity led to increased demand for labor-saving equipment and consumer products, and this in turn increased demand for workers in nearby industries producing agricultural equipment and consumer goods such as textiles and garments. More jobs were created in industry, and many peasants moved off the farms to the higher-paying urban-based industrial jobs. An export-oriented strategy of industrial growth based on the comparatively low cost of labor further fueled the demand for rural laborers in cities, and the migration of ruralites to cities proceeded rapidly. Hence, a shift in the structure of production from agriculture to industry occurred. In Japan this shift took place during the 1950s. In Taiwan it began in the mid-1960s, and based on employment sectors, the economy was more industrial than agricultural by the early 1970s. In Korea the shift occurred in the late 1970s.

The East Asian cases of Japan, Taiwan and South Korea are thus valuable because of their similarity to China in cultural backgrounds and settings, despite obvious historical differences in the manner in which the civilizations have developed and the societies have evolved. Taiwan, of course, is a Chinese culture despite its 50 years of Japanese colonial history (1895–1945). Although these three examples are market-based economies, the success of this East Asian model makes it valuable as a comparative theoretical device for events unfolding in China today. Such a model is useful as we seek to evaluate and understand the significance of far-reaching changes underway in parts of Jiangsu Province in recent years.

Structural shift in the rural and peri-urban economy of Jiangsu Province may be a useful guide to understanding economic growth and development in the larger body of China in the future. Analysis of changing employment patterns and rising income of rural workers in a number of different regions of Jiangsu should permit us to understand better the conditions of economic change and development and to affirm the extent to which these conditions of change and development comport with Oshima's East Asian model and the broader theories of development and structural change noted above. It may also help us to evaluate whether or not China's path to development, based on special conditions of rural change, is indeed a unique case as postulated in models of economic development and structural shift without massive urbanization (Perkins and Yusuf 1984, 3–28; Zweig 1987).

Weitz's Model of Agricultural Change in the Context of Jiangsu

Another useful model of rural change and agricultural development posits a three-stage sequence from subsistence to mixed to specialized farming (Weitz 1971). While all of the conditions that Weitz (1971) identified may not be found in China, the idea of transforming the agricultural economy from a subsistence system, where production is sufficient for local needs with low levels of surplus and exchange, to a mixed, diversified kind of farming—as a first step toward specialized farming—is useful

and appealing. This kind of transformation will depend on the ability of farmers to increase productivity and output, itself dependent on changes in levels of technology, availability of modern inputs, and improvements in knowledge of farming and marketing conditions (Zweig 1985). Such a progression also implies greater commercialization and integration of rural areas with urban markets. Ultimately, as progress continues, the shift to a specialized kind of farming with high land and labor productivity and a high degree of commercialization of surplus production will follow.

At this point, it is not certain if China views this sequential model as appropriate. But the terminology of mixed and specialized farm households is used frequently, implying that this model has relevance for the Chinese case (Xue 1986; Liu et al. 1987). Moreover, the Weitz model is valuable in that it provides a context for examining and evaluating the transformation of agriculture and the rural economy in China.[1]

At the present time, the direction of the new rural policies in China is unclear. In Jiangsu, most local cadres and rural planners are actively supporting what has come to be called the "mixed" peasant household, in which the members of a single household generate income from a combination of agricultural, industrial and cottage-style activities. This mixture was certainly the prevalent pattern among households included in our surveys. Whether or not this is intended to be the pattern of the future is not certain. Many researchers have endorsed what might be called the "specialized household" model where agricultural production increasingly becomes the sole occupation of gifted and knowledgeable farmers, as off-farm employment develops sufficiently to draw surplus rural labor from the fields. Research on the appropriate scale of holdings (Wu 1987) suggests that a farm household could be much more efficient if landholdings were increased by a factor of three. This would mean that if the "specialized household" model is adopted extensively, two of every three families would be convinced or coerced to give up their land. This model would create a much different employment structure than the one currently in place.

It appears then that the critical policy question is whether the "mixed" income household is a transitional type which will be phased out as the "specialized household" develops, or whether it is to remain the basic production model in Jiangsu and the rest of the country. If it is a transitional model, the current inequity between farmers with off-farm employment and those with no off-farm employment does not need to be addressed. But if it is not, then local and regional inequities appear to be increasing, either as indicated in Chenery's model or perhaps on a more long-term, enduring level.

Background and Study Area

Jiangsu is one of China's most economically advanced areas. The lower Changjiang (Yangtze) Basin has about 1100 mm of precipitation annually, a growing season of approximately 230 days and generally productive red and yellow alluvial paddy and podzol soils. The region developed an intensive rice and fishing economy more than 1000 years ago. With steady production growth over the centuries, improvements in farming led to more intensive cropping systems based mainly on rice but including also vegetables and cash crops such as mulberry/silkworms, tea and cotton. Improvements in transportation developed over the centuries. The lower Changjiang region early had an effective and low-cost transport system based on rivers and canals which integrated the local and regional economies with the larger political control centers and regions of the North China Plain through the Grand Canal. Thus for many centuries this region has been one of China's most advanced in economic development and production.

The region's spatial integration has continued into contemporary times and has made this part of China a laboratory of great significance for analyzing conditions of economic growth and development under socialism (Wiens 1982). Regions such as Jiangsu are good bellwethers for the broader Chinese economy and help indicate the direction and success of policies for the entire economy (Rothenberg 1987).

Initially designed to study different cropping systems and strategies in southern Jiangsu, one aspect of this study evolved a focus on income among farm families. The study area was expanded to include two counties in northern
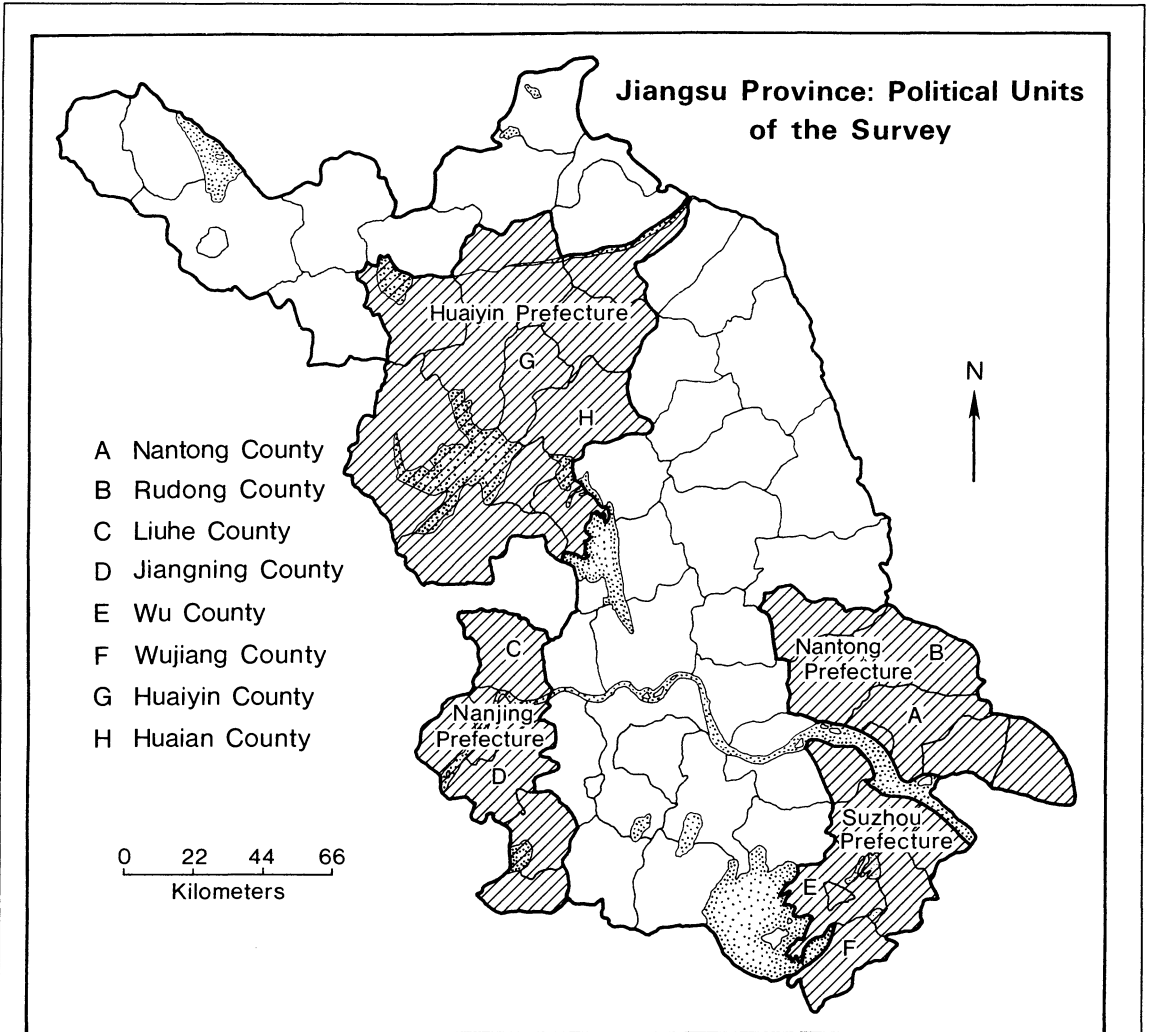
Figure 2.   Prefectures and counties where sample surveys were conducted in Jiangsu Province.

Jiangsu to provide a broader sample that re-
flected conditions throughout the province.
The four specific regions for farm interviews,
each of which contained two counties, are de-
picted in Figures 1 and 2. These are: (1) two
counties within Nanjing Prefecture north and
south of the Changjiang; (2) suburban areas of
Suzhou city, one northeast of the city and one
near Lake Tai; (3) rural areas in Nantong Pre-
fecture on the northern bank of the Chang-
jiang, one along the river and one near the
coast; and (4) partially rural areas near Huaiyin,
an old port city on the Grand Canal in northern
Jiangsu Province.

These four study sites represent somewhat
different environmental settings within the
broader setting of Jiangsu Province and also
varying degrees of linkage to urban market-
places of varying sizes. These variations affect
the possibilities for marketing various com-
modities produced on the farms, but more im-
portant, they provide different labor oppor-
tunities for peasants seeking industrial or service
jobs and in that way may strongly affect the
total farm-family income. Patterns of income
and locational variation within each of the four
study areas as well as among them will be ana-
lyzed.

Data and Methodology

Data for this study were drawn from larger surveys on family farm production and income conducted during late 1986 and 1987 at the four study sites.[2] The methods employed were selected to test and answer three main hypotheses. First, we hypothesize that off-farm employment opportunities have become the most important source of income; families which do not have access to such opportunities will exhibit much lower incomes. We will describe, compare and analyze patterns of farm family income in the four study areas of Jiangsu Province. This will be done by providing a series of quantitative measures on various indices of average family income, such as average income derived from crop production, sidelines, industrial jobs, and other activities in the different regions. Tabular statistics and correlation analysis will be used to verify this hypothesis. Later the use of principal components and cluster analysis will be employed to identify internal variation among households for income-related variables within each county and to identify household types grouped by income characteristics rather than by location.

Second, we hypothesize that variation in the degree of commercialization within the agricultural systems points to higher income associated with proximity to urban markets or access to rural or urban industrial employment opportunities. Summary statistics based on location alone would neglect this important pattern of local income variability and uneven employment opportunities which have considerable political and policy significance. Preliminary analysis of the income data suggests that households within each county, or even township, exhibit a notable degree of variation in the sources of income from household to household. That is, the location of each household may sometimes be a poor estimator of total income or the sources of that income. We report data on the economies of the basic economic unit—the household.

Third, we hypothesize that distinct "household types" can be identified which represent the different strategies which households have used to generate income. Both the Weitz and Oshima models may be invoked to help understand the process of family economic behavior in the Jiangsu sampled households. In

this way, we may identify a sequence of development taking place in rural and suburban Jiangsu and reflected in farm-household activities.

Classification with Principal Components and Cluster Analysis

To provide a rigorous means for accepting or rejecting our second and third hypotheses, we can classify the households and identify the appropriate criteria for distinguishing "household types." The first step will be to determine what demographic or income variables will explain the variance observed among the sampled households. Principal components analysis (PCA) is a method for expressing information in an alternative form which is often more succinct than the original (Jackson 1983, 111–130). For each component created, each household in the sample will have a component score, which describes the location of that observation on the component.

In a sense, these new variables are denser manifestations of the original variables. Once these component scores have been created through PCA, they can be used like other variables to create groups through cluster analysis. The cluster analysis will be used to assign membership in defined groups to each household in the sample. Because the component scores derived from the PCA will be used to determine the clusters, the clusters represent the types of households delimited by the PCA. Once each household is assigned membership in a "household type," sources of income and household characteristics will be identified for each type.

One cautionary note regarding the survey data is in order. The farmers interviewed had higher incomes, on the average, than the average incomes reported in 1986 Chinese county survey data of the same counties. In two cases (Nantong and Huaiyin Prefectures) the surveyed farmers had average incomes about twice those reported in official data (Editorial Committee, 1987, 3:67–83). The reasons for this discrepancy are not entirely clear, but we believe that Chinese officials wished to provide sample farmers who were generally more successful and prosperous than were average farmers in the four respective study areas.[3]

Table 2. County Average Income, Farm and Family Size, Jiangsu Sample[a]

	Nantong		Nanjing		Suzhou		Huaiyin	
	Nantong	Rudong	Liuhe	Jiangning	Wu	Wujiang	Huaiyin	Huaian
Sample size (households)	n = 7	n = 11	n = 23	n = 21	n = 26	n = 8	n = 30	n = 39
Net agriculture	1711	1621	2157	1138	622	1049	1263	1969
Net sidelines	728	764	704	800	590	650	1063	924
Net industry	2657	2480	1022	541	4009	2888	146	633
Gross sales	831	573	2076	1024	69	400	402	1179
Net other	0	336	599	655	252	33	802	1187
Farm size (mu)	3.4	4.7	7.5	5.8	2.5	4.9	5.2	5.2
Family size (persons)	5.3	4.2	4.7	4.3	4.1	4.9	4.5	5.4
Per capita income	962	1238	954	729	1335	943	728	873
Total	5096	5201	4482	3134	5473	4620	3274	4713

[a] Units = yuan.
Source: Field surveys, 1986–87.

Findings and Interpretation

Farm-family income within the study areas of Jiangsu Province varied markedly both among and within the four study areas. Suzhou and Nantong Prefectures had easily the highest average incomes of the areas studied; this level was reflected in the official data as well as the survey data. Nanjing and Huaiyin followed, with Huaiyin having the lowest income according to official data. A comparison of official data and survey average income data showed that the surveyed averages were closest to official averages in Nanjing and Suzhou, with the greatest discrepancies occurring in Huaiyin and Nantong Prefectures. The reasons for this indicate the non-random nature of the sample surveys. The farmers surveyed were selected by local responsible units and not by the investigator. The high average incomes in the Nantong sample may also be explained in part by the small sample size (18 families) in Nantong Prefecture compared with larger samples (34, 44 and 69) in the other three prefectures.

Generally the official data on prefectural income agree logically with data presented in Table 1, which indicate employment share of labor in four major sectors of the prefectures surveyed. Huaiyin has the highest agricultural employment (80 percent) and lowest industrial employment (4 percent). Suzhou is the reverse, with the lowest agricultural employment (38 percent) and the highest industrial employment (38 percent) among the four prefectures. Nanjing and Nantong had almost equal agri-

cultural employment shares (51 percent and 53 percent respectively), but Nanjing had 23 percent industrial employment compared with Nantong's 17 percent. The employment patterns in these two prefectures suggest that the Nantong sample was the least representative of average conditions in that prefecture.

Data on a number of different components of average income were collected. Findings are reported on nine that seem most salient and directly linked to the issue of income and how it was earned in these farm families. Averages for various measures of farm and related income, family, work force and farm size are reported in Table 2.

Among the most interesting and challenging regional findings are the high average industrial incomes reported in Suzhou and Nantong Prefectures. Farmers are traveling off farms to work full time in rural or suburban industries, while other family members help with much of the farm work. Often more than one family member has a factory job, and farming is a part-time activity. Nowhere is this more apparent than in Suzhou Prefecture, where average net agricultural income is less than 15 percent of the average total income for the 34 farm families surveyed. In Huaiyin Prefecture average net income from field agriculture, among the 69 families surveyed, is about 40 percent of the average total income. Remarkable discrepancies exist among farmers within each county; these appear to reflect proximity to urban markets and greater accessibility to industrial job opportunities. Nantong Prefecture has developed

Table 3. Pearson Correlation Coefficients for Significant Variables Associated with Total Income

	Nanjing		Nantong		Suzhou		Huaiyin	
	Liuhe	Jiangning	Nantong	Rudong	Wu	Wujiang	Huaiyin	Huaian
Agriculture	.19	.73	.57	.58	.46	.13	.38	.79
Industry	.95	.91	.57	.38	.86	.96	.31	.39
Sideline activities	−.33	.55	.71	.16	.60	.51	.66	.22
Other income	.00	−.05	.27	.50	.42	−.34	.61	.70
Farm size (in mu)	.26	.25	−.22	.56	.37	.46	.24	.12
Family size	.83	.57	.45	.33	.69	.61	.31	.29
Work force size	.91	.77	.82	.40	.73	.32	.48	.42
Net/gross income per mu	.55	−.40	.06	−.23	.27	−.87	.01	−.01

Source: Calculated from field survey data, 1986–87.

into a center for light industry because of its access to national and international markets via good water transportation.

Income from sideline activities varied, with Suzhou having the lowest and Huaiyin the highest averages. Sidelines range from raising silkworms, fowl and fish to cultivating clams for pearls. Sideline activities appear most important in those areas where farming remains most important. At the same time these activities obviously require a market linkage and proximity to a commercial center and a system of commercialized agriculture. Paradoxically Suzhou, whose households have perhaps the best spatial and commercial linkages, has the lowest income from sidelines. This apparent paradox likely occurs because alternate off-farm opportunities are more lucrative. The category "Other" income ranges markedly from a high of more than 1000 yuan in Huaiyin to nothing in Nantong.[4] This income was derived from activities including government work, service jobs and self-employment, such as truck- or boat-driving or wholesale activities.

Throughout this sample survey there was little variation in family size and the size of the family work force. There was, however, a significant difference in farm size, with Nanjing and Huaiyin having average surveyed farms of more than 5 mu, whereas Suzhou farm size averaged only 3.55 mu.[5] Obviously farm size is related inversely to population density, which in turn reflects the availability of more alternative income sources in the Sunan region. Again this finding suggests that in Nanjing and Huaiyin the sample surveyed was a more rural group devoted more strongly to farming as their major activity than were those in Suzhou. In

Suzhou the farm size, and therefore logically the income opportunities and labor demands of farming, are reduced. This is corroborated in that the average share of income derived from agriculture in Suzhou Prefecture is lower than in the other areas. Agricultural income does not give a good indicator of total income, for conversely the Suzhou farmers, with the smallest average agricultural income, had the highest average total income of the Jiangsu sample (Table 2). This finding alone offers evidence to justify accepting our first main hypothesis.

Relationships Among Variables

If we take the major income-related variables on which this study is based and run cross-correlations on all the variables for the entire sample of 167 farm families, a few significant relationships appear. The size of the work force in the family was most significant in explaining the size of three income measures: agricultural net, industrial employment, and total income. This is logical, and it seems clear that where the work force is larger, one or more family members are going off the farm to work in a rural collective factory and are in fact earning at a higher rate than would be possible if they were concentrating only on farm work. Another important contributor to total income, according to the correlation coefficients, is income produced from sideline activities. Sideline activities in Jiangsu, as noted, include such farm-related activities as animal husbandry; fish farming; raising chickens, ducks and geese; growing ornamental trees; raising silkworms, bees,
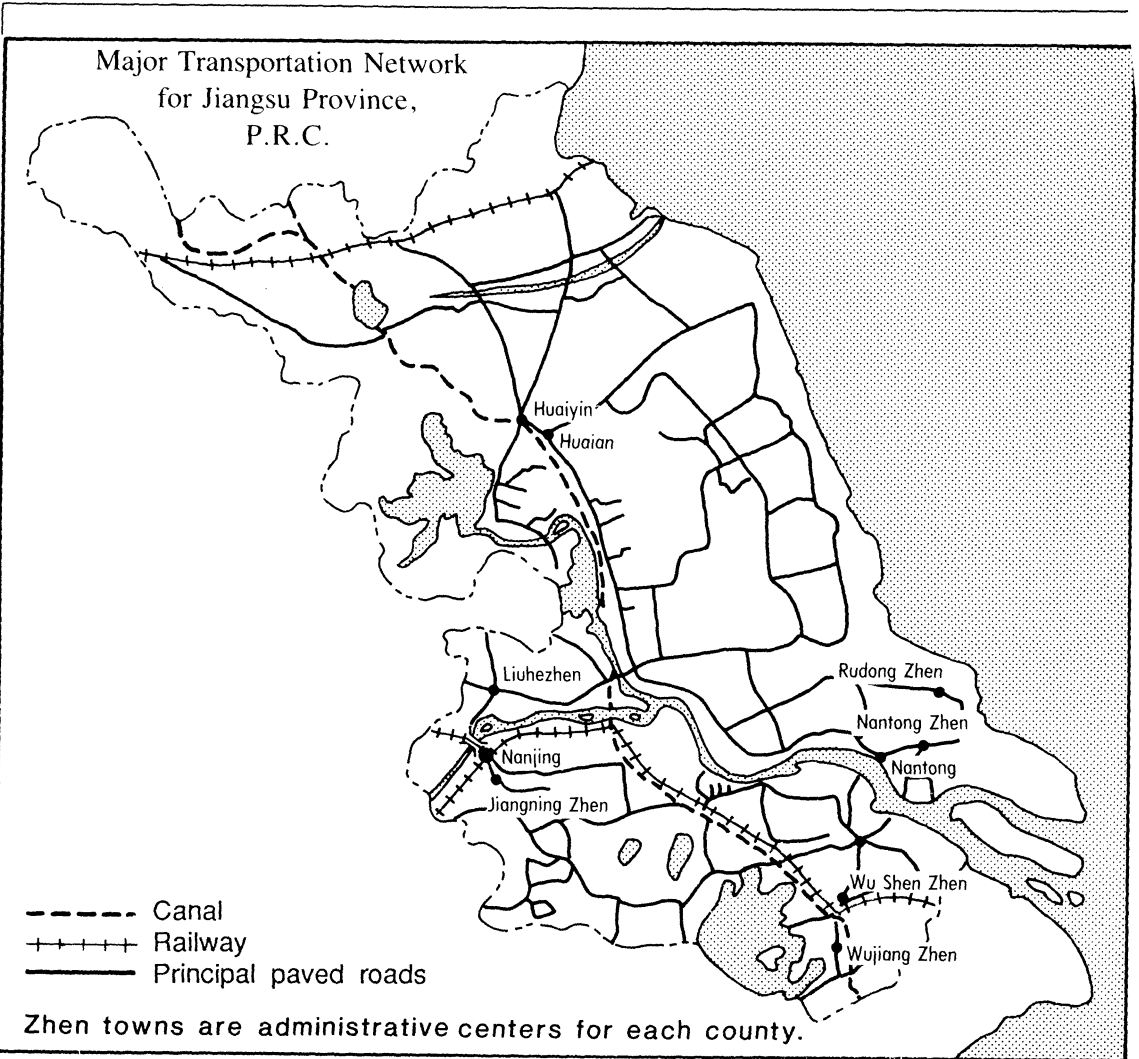
Figure 3. Main transportation lines in Jiangsu Province.

earthworms, and scorpions (for medicine); or making small items such as ornaments or brushes for export.

Finally, the main determinants of total income for these 167 farm families as indicated in these cross-correlations were (1) income from industrial employment (r = .60); (2) income from other activities such as serving as a cadre, teacher or truck driver (r = .40); and (3) income from sideline activities (r = .26). Closely related factors were the size of the family (r = .38) and the size of the workforce (r = .54) in that family. It is interesting that the area of the farm (in mu)

indicated little effect on total family income (r = .05). These results provide further justification for accepting our first main hypothesis that the primary sources of family income are based on off-farm employment.

Regional Analysis of Income Patterns

There is considerable regional variation in how Jiangsu farmers derive their incomes. This variation may be seen at two scales within the Jiangsu provincial sample of 167 households.

First, there is some interesting yet complex variation among the four prefectural sample survey sites. To some extent this variation may be accounted for superficially by the general location and proximity of the sample to a large urban center—Nantong, Suzhou, or Nanjing, for example. More important may be a second factor—where the sample survey is located relative to market centers of varying sizes nearby and to what extent this specific study site may have good connectivity to local urban or peri-urban activities that offer either marketing opportunities for farm commodities or other off-farm employment opportunities such as truck driving or factory work (Fig. 3).

The patterns of income generation in this rapidly changing and economically dynamic part of China are varied and complex. The analysis will attempt to identify some of the patterns that emerged in the eight counties and four prefectures studied. Our specific goal is to point to what may be salient relationships and associations among different income-generating activities—farming, industrial employment in rural industries, sideline activities, and other sources of income. We also explore what effect family size, work force size, and farm size have on family income.

These variables can be evaluated on the basis of Pearson correlation analysis for the eight-county sample surveys (Table 3). For purposes of causation, we view total income as the dependent variable, and the other factors are associated as having some role in determining farm-family income. Conceptually this perspective is logical and appropriate because we are analyzing a set of policies and a farming system in flux, and our goal is to identify and determine factors affecting overall household income. Our major assumption is that policies which are decentralizing decision making on cropping, land tenure and use and marketing of farm commodities are affecting the changing patterns of farm income. We further assume these farmers seek to increase their incomes and will make choices and operate in such a way as to raise total household income.

In all of the study sites (Table 3), income derived from rural collective industrial jobs is a very significant part of total income. This is especially prominent in the counties in Suzhou (r = .86 and .96) and Nantong Prefectures (r = .95 and .91). In Huaiyin Prefecture the area most removed from a major urban center, the re- lationship between industrial income and total income was weakest (r = .31 and .39). Industrial income was also generally closely associated with family size and size of the work force; it is clear that both variables are also consistently and closely tied to the size of family income. Such a pattern makes sense whether one is considering income derived from farming, sideline, industrial or other money-generating activities. The larger the family and work force, the more people available to work and earn.

Income generated from agricultural activities presents a more varied pattern spatially. For example, all prefectures have counties with significant agricultural income. Only Wujiang and Nantong Counties have correlation coefficients of less than .20, and these are the two counties that have the highest correlation coefficients associated with their industrial income (r = .96 and .95 respectively). Huaiyin and Huaian Counties are noteworthy because they are far from a major metropolis and in that sense seemingly more rural. But Huaiyin city had 373,000 people in 1985 and possessed a sizable urban hinterland. In these two counties the correlation coefficients associated with agricultural activities were split (Huaiyin—r = .38 and Huaian—r = .79), which reflects the urban/peri-urban and rural dichotomy. This difference suggests significant contrasts between these two counties in the manner in which economic reforms in agriculture are taking effect. If we turn to income from sideline activities, Huaiyin's pattern is more logical, for here total income has a high association with sideline activities (r = .66). Yet other areas are not so clear. Total income in Nantong County, for example, is inversely associated with sideline activities (r = −.33), whereas Jiangning County in Nanjing Prefecture and Wu County (fish farming) in Suzhou Prefecture have high associations (.71 and .60). The importance of sideline production to total income varies considerably from place to place, and it is necessary to examine each locale and investigate the many specific and often complex ways in which local farm families have learned to supplement their incomes.

The size of the farm (cultivated area) is another important variable in the income equation. Generally farm size does not associate strongly with total income. In two counties where the sample farmers generated a substantial share of their income from agriculture (Rudong and Liuhe), large farm size was associated moder-

ately with total income. Paradoxically, among the sampled farmers in the county (Huaian) that had the strongest linkage between agricultural income and total incomes, farm size was a poor predictor of total income ($r = .12$). Specialized cash cropping in this area renders the usual relationship between farm size and farm income inconsequential. A number of these farmers were specializing in vegetable production to local wholesalers for resale in Huaiyin or even as far away as Nanjing.

This finding suggests that the relationships among farm size, agricultural income and total income in Jiangsu tend to be highly localized and place-specific. It illustrates again the enormous variety and the far reaching complexity of the ways of farming and maximizing income that exist in a region of great economic dynamism and change under policies of economic reform and restructuring. The above analysis also indicates the difficulty in establishing the role of location in determining household income. The degree of spatial complexity of the patterns identified makes it impossible to accept our second hypothesis. Location is no doubt important, but our analysis does not permit us to specify exactly how it affects total income.

Perhaps the most challenging of the listed variables is the one pertaining to capital conversion per unit of land under cultivation. This is, in fact, the net-to-gross income ratio that represents, exclusive of labor, the profit-to-cost ratio of farming on the land. How does it relate to total income? Not very well, although there are some interesting facets of this variable among the eight study sites. In Wujiang County (Suzhou Prefecture), the county with the weakest agricultural and strongest industrial income in relation to total income, the total income was strongly inversely related to the net-to-gross income ratio ($r = -.87$). This finding suggests that farming in an area where much of the family's income is derived from industrial jobs becomes a secondary activity, and there is little or no interest in worrying over whether the land is farmed productively and intensively. A different pattern is true for Nantong County where industrial income is strongly and agricultural income weakly associated with total income. Here the farming seems to be more intensive in terms of annual land use, and the application of organic manures, which are very cheap or free, is the second highest ($r = .55$)

among members of the surveyed sample for the wheat-rice crop combination.

Principal Components and Cluster Analysis

The previous analysis was directed at comparing and contrasting the various income variables as they differ by location. The principal components analysis (PCA) and clustering analysis procedures were intended to isolate aspatial "types" of households which exhibit similar characteristics and could be used to explore further the impact of off-farm income on household economies within the surveyed regions of Jiangsu.

The principal components analysis was conducted using seven variables by which variation among the households in the sample could be identified. These variables are: number of persons living in the household, the area of agricultural land under contract, the gross value of off-farm sales, annual agricultural net income, annual net income from sidelines (cottage industries and husbandry), annual income from industrial employment, and income from nonindustrial off-farm employment.

The PCA resulted in the identification of three eigenvectors (Table 4). The associated eigenvalues can be used to determine the amount of total variance explained by each vector. The three eigenvectors (components) accounted for 72 percent of the variance within the seven variables across the entire sample. The first component had high correlations with agricultural net income (.91), off-farm sales (.86), farmland under contract (.86), and family size (.54). These loadings suggest that large scores on the first component are associated with households which could be viewed as traditional agricultural peasant households. This component was labeled "the traditional agriculture component"; it accounts for 39 percent of the variance.

The second component accounts for 17 percent of the variation. While agricultural variables do not load highly, industrial income (.78) correlates highly with the second component. Large scores on the second component are associated with households with industrial income, but not the other types of off-farm employment. This component is defined as the "industrial income component."

The third and final component accounted for

Table 4. Principal Components Analysis on 167 Cases From Jiangsu Sample

	Component loadings		
Variables	1	2	3
Agricultural net value	.91		
Agricultural off-farm sales	.86		
Farm size (mu)	.86		
Family size (persons)	.54		.52
Industrial income		.78	
Other income		.69	
Income from sidelines			.85
Variance explained by each component (percentage)	39	17	16

Source: Calculated from field survey data, 1986–87.

Table 5. Membership in "Household Type" Classification Determined by Ward's Minimum Variance

	Prefecture			
Cluster (percentage)	Nan-tong n = 20	Nanjing n = 45	Suzhou n = 34	Huaiyin n = 68
Agriculturally focused	8 (40)	25 (56)	1 (3)	39 (57)
Intermediate group	5 (25)	19 (42)	1 (3)	24 (35)
Industrially focused	7 (35)	1 (3)	32 (94)	5 (7)

Source: Derived from field survey data, 1986–87.

16 percent of variance within the sample. It was poorly correlated with both the agriculturally related and industrially related variables, but did correlate with income from sidelines (.85).

The PCA results in the production of three component scores for each household. The scores are transformations of the original seven variables; they are also uncorrelated. The component scores are used to create household clusters which display relatively homogeneous characteristics with respect to income sources and family size. The clustering method selected was Ward's minimum variance procedure. While any number of clusters can be stipulated for the cluster analysis, the data reflects a three-group natural break (Table 5). These three clusters explain more than 62 percent of the variation of the 167 households. The clusters may also be given descriptive names based on the characteristics of the households classified in each type. The identification of these three clusters associated with specific rural household types also justifies the acceptance of our third main hypothesis, which posited that distinct household types could be identified in the restructuring economy.

The first we call the "Agriculturally Focused" cluster. These households are characterized by the lowest per capita and total household incomes, a small reported workforce, and the greatest percentage of total income derived from agricultural production. These families most closely resemble the subsistence farmers in the Weitz model. The cluster analysis placed the largest number of households in this category. Of the 167 household sample, 44 percent (74) were included in this household type.

The second cluster includes the "Interme-

diate Households," where income from agriculture and industrial positions are both important. The values for the income-related variables tend to be considerably higher than those of the first cluster. The amount of contracted land by household is more similar to the households in the first cluster than to those in the final cluster. Family size for this intermediate group is larger than for the other groups. This middle group represents 29 percent (48) of the sample. In general, these households appear to be much more involved in commercial agriculture than do the traditional households, with the value of off-farm sales more than double the value for such sales for the more traditional "Agriculturally Focused" households. These households seem to be committed at least in part to increasing income through expanded agricultural production, as indicated by greater off-farm sales and larger amounts of contracted land. They appear to identify most closely with the "mixed" farmers discussed in Weitz's typology. These households also present a contrast to the final group, whose members apparently have rejected agriculture as a significant means of raising household income. It is possible that this type of household represents a transitional form between the first and third types. An alternate interpretation is that these intermediate households could also potentially become specialized agricultural households (*zhuanye nonghu*) and focus their energy on producing a single crop or commodity efficiently. Here they would more closely resemble the specialized farmers described by Weitz.

The final cluster is composed of households in which industrial income is of primary im-
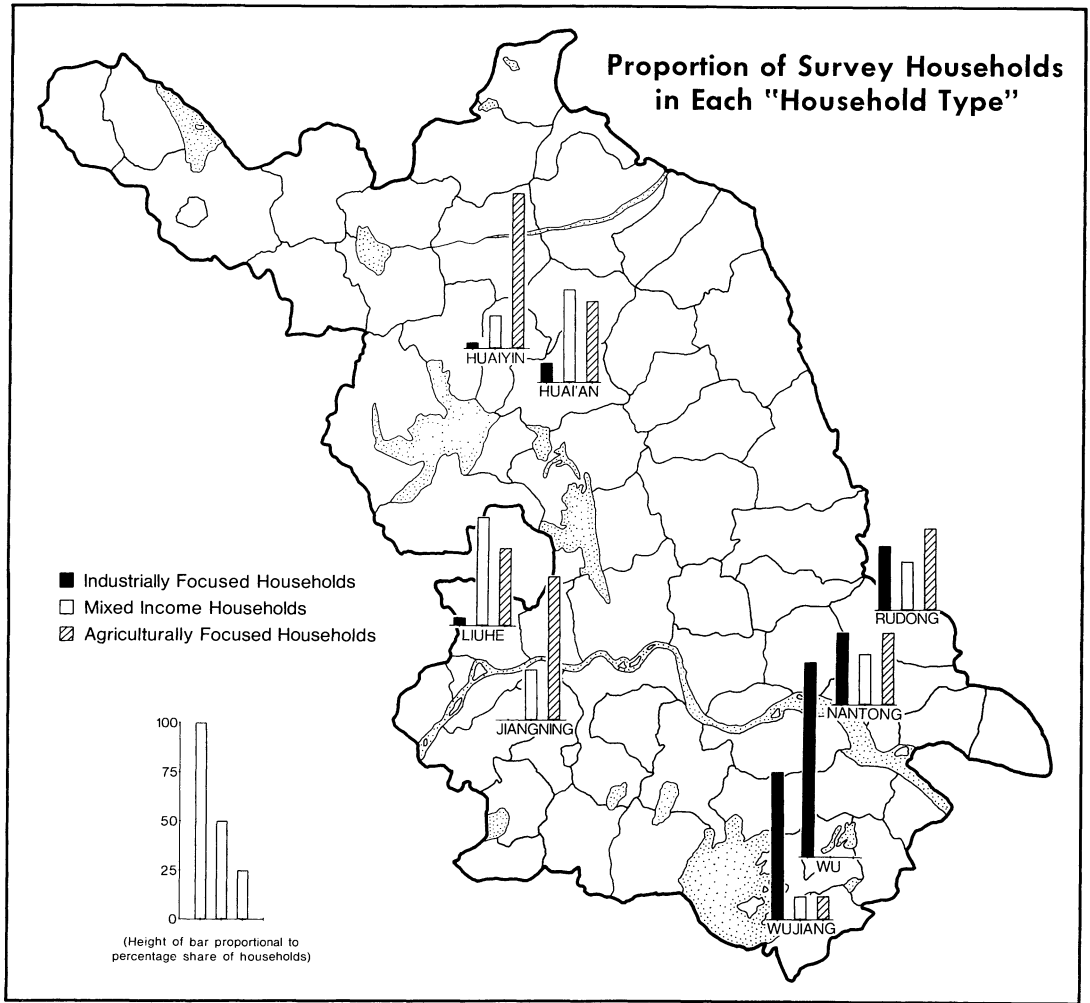
**Proportion of Survey Households
in Each "Household Type"**

■ Industrially Focused Households
☐ Mixed Income Households
▨ Agriculturally Focused Households

100
75
50
25
0

(Height of bar proportional to
percentage share of households)

HUAIYIN
HUAI'AN
LIUHE
JIANGNING
RUDONG
NANTONG
WU
WUJIANG

Figure 4.   Household types identified in eight county sample surveys through cluster analysis.

portance. In addition to this source of income, these households have more working family members, less contracted land, and minimal agricultural sales. This cluster represents a new type of peasant household which, except for location, could easily be considered to be like the households of suburban industrial workers. These households, the most dramatically different among households in the rural areas in Jiangsu, might be called "Industrially Focused" households. The "Industrially Focused" households represent 27 percent (45) of the sample.

   While the principal purpose of the PCA/

clustering procedure was to assign membership to each household, there are significant spatial patterns which should not be overlooked. Figure 4 indicates the location in the prefecture of the families within each household type. In some cases, the pattern is exactly what would be expected by researchers familiar with Jiangsu. Of all households in the "Industrially Focused" household type, 71 percent are in Suzhou. Similarly, 55 percent of the households within the "Agriculturally Focused" group are in Huaiyin. Household types for these locations are relatively homogeneous. For the

other prefectures, this is not the case. There are households from almost every county in each of the groups. These distributions reflect the diversity of household types in any given location (Table 5). Multiple household types in most villages imply disparities in income and opportunities.

These different household types report significantly different levels of income, different sources of that income, and different demographic characteristics. The total annual income for "Industrially Focused" households is almost double that of households relying on agriculture. Per-capita income for these more affluent households is 57 percent greater than for the "Agriculturally Focused" households. The "Intermediate" group not only has procured more industrial employment, but has expanded agricultural sales as well. With respect to the goals of provincial leaders which stress maintaining high farm output, improving efficiency and raising family income, these intermediate households might be considered most successful.

Conclusion

The complex and varied manner in which Chinese farm families earn their incomes raises significant structural and spatial questions. The opportunities and possibilities of earning money in different regions of Jiangsu Province and, by extension, China vary greatly. These opportunities reflect the extraordinary, pervasive influence of the economic reforms and adjustments of the last decade on farming and related rural-based activities. These income patterns also indicate a wide-ranging set of opportunities off the farms, as many farmers in peri-urban zones and even in more remote areas avail themselves of industrial job opportunities that appear to offer higher incomes.

Jiangsu Province is clearly special in that it, and certainly its southern region (Sunan), represents one of China's most economically advanced and rapidly developing regions. It should be viewed as unusual in the degree of commercialization of agriculture, the degree of development of transportation and communication linkages, the size and complexity of its urban markets and marketing networks and the levels of demand that exist among both urban and rural consumers. Given those conditions,

Jiangsu also represents what China's future may hold for less developed regions in the country's interior. The differences seen among the four prefectures and eight counties is itself striking, and it is more complex than a purely urban and rural, or southern Jiangsu and northern Jiangsu, pattern.

Clearly the farmers closer to the thriving city of Suzhou are the most prosperous, but one musk ask if in fact they are truly farmers. Since the bulk of their income is derived from non-farm activities, this raises serious questions about the true nature of their livelihood and lifestyles. For example, in Suzhou Prefecture off-farm agricultural sales constituted only 2.7 percent of annual total income among the farmers surveyed. Industrial income is also important in Nantong and Nanjing Prefectures, which indicates that those areas along Jiangsu's east coast and mouth of the Yangtze River may be benefitting from their proximity to water transportation and China's greatest industrial city, Shanghai. This Nantong region is obviously changing quickly, and the manner in which farmers here earn their livings reflect this change.

Nanjing Prefecture offers a sharp contrast because its nearby farmers seem to follow more traditional patterns and are less drawn into the alluring urban/industrial employment orbit. Liuhe County, the county seat of which is 36 km north of the Yangtze River, especially exhibits a more traditional/less commercialized rural pattern. This description reflects its more remote location from the large urban market of Nanjing and its less well-developed transportation system. Finally, it seems clear that Huaiyin Prefecture is a less advanced region and presents a different kind of place. At once less wealthy, its family size on average is larger, and these families rely far more heavily on farming and related activities, although some derive substantial income from other kinds of activities such as services.

Farmers above all want to increase their incomes, and the entire family will be involved in strategies to attain this goal. These farmers discover where the greatest advantages are and where the best opportunities lie. Often these opportunities are not to be found on the farm for the main breadwinners. Traditional row-cropping, especially for food grains, does not yield high incomes because of the comparatively low prices offered for grain and thus a

low return for this type of farming. Production of cash crops such as ramie or other specialized sideline activities such as raising geese or chickens provide more income. Even better may be the opportunity to drive a truck or develop a wholesale vending operation involving some specialized good or commodity needed in a distant city. Finally, factory work in a rural collective or perhaps some nearby market town attracts many farmers. This attraction is a major first step in the social change and urbanizing of many of China's peasants.

China's Development Path: The Jiangsu Model

The evidence presented here, despite the socialist context, suggests a pattern of economic change in Jiangsu that appears to be following the neoclassical model of structural shift with, perhaps, special East Asian and Chinese conditions (Lewis 1955; Fei and Ranis 1964; Chenery and Sryquin 1975; Oshima 1983; Xue 1986). Incomes are rising, and peasants are taking non-farming jobs to supplement their incomes. In some cases, as in Suzhou and Nantong, the farming activities have become negligible or secondary as peasants hold onto the land but lose their enthusiasm for farming. This pattern suggests the kind of part-time farming going on in Japan or Taiwan and indicates that Oshima's (1983) model of East Asian industrial transition is valuable in anticipating current and future changes in China, despite the difference of a socialist path to development. It further suggests that China's industrialization, with its focus on peri-urban and suburban as well as rural location, may simply be a variation on the traditional theme of industrialization cum urbanization and not a distinctive, special form of development (Perkins and Yusuf 1984; Zweig 1987).

We close by returning to the three main hypotheses posed earlier in the paper: (1) higher rural family incomes in Jiangsu are generated by off-farm employment; (2) higher incomes of farm families are associated with proximity to main commercial centers; and (3) distinctive rural household types can be identified in the province. Two of these three working hypotheses are accepted. We have demonstrated empirically that the greatest contribution to farm income in Jiangsu typically comes from employment that is off-farm, especially industrial

or service jobs. Location near major market centers, while important, is not clearly associated with higher income. The pattern is more complex and likely reflects the nature of existing transport networks and possibly a variety of other social and personal linkages. Euclidean distance to main market centers or distant cities is not the simple answer, and thus there is insufficient evidence to accept the second hypothesis. Three distinct household types were identified through cluster analysis. The first two—subsistence and the mixed diversified types—comported well with the conceptual model of Weitz discussed above which posited a sequential shift from subsistence to mixed diversified to specialized farming. In Jiangsu all three of these types were identified and associated with specific farm families, which were further described and typed according to how they earned their incomes. Yet there appears to be some uncertainty about the wealthier and more specialized families. In many cases, as noted, it was not clear if in fact these should be considered farm households since so much of their income is derived from nonfarm sources.

What kind of farmer does China really want? Is the specialized farmer with a higher degree of efficiency in producing a specialized crop or product the model of the future? If so, what will happen to those farmers who are less successful? Will they be pushed into other kinds of service or industrial activities? Where will these people live and how will they obtain their food grain ration? There are obviously many questions about the direction and pace of China's path to agricultural modernization as a facet of structural shift.

At the same time the question as to the success and efficacy of rural and agricultural reform must be raised. If the government's main goal is to produce more food grain in the most efficient manner, it does not appear to be working in some of China's most advanced regions, despite the well known representation of these regions as centers of advanced agricultural development. The peasants only perform what is necessary to satisfy government quotas so that they may keep the land (Han 1988). On the other hand, if the government in fact is most interested in maximizing incomes and improving the well-being and livelihoods of its rural population, the policies would appear to be successful. Of special interest is the manner in which modernization is proceeding

in a sort of quasi-urbanizing of some peasants. This approach may well represent an interesting and feasible solution to the question of the massive transfer of rural population and the creation of super cities.

This possible solution has been embodied recently in the formal policy of "Litu bulixiang" (Leave the land but not the township or village) (Zhu 1986). What results is an in situ partial urbanizing of rural people who remain in rural townships and take up nonfarm sector employment without migrating to cities. Other peasant families remain in part rooted to the soil and still produce food even if not too efficiently. China thus may have discovered its own middle ground, wherein many rural families begin the sometimes difficult process of adapting to nonfarm sector jobs and partially urban styles of life, but in very familiar surroundings and with little investment in infrastructure. The unanswered question, of course, is, what is the long-term effect of such a policy and trend on the efficiency of production when factors such as labor and capital have state-controlled limits on their mobility.

Acknowledgments

Notes

1. A good review of Weitz is contained in Todaro (1985).
2. The study was supported by the Committee on Scholarly Communication with the People's Republic of China (National Academy of Sciences)
and the National Geographic Society. The Chinese Ministry of Education approved the project, and the Department of Agromony of Nanjing Agricultural University and its former department head, Professor Zhang Xigu, were the in-country sponsors.
3. Conditions for doing foreign field research in China, especially where systematic survey research is involved, are very difficult. The selection of the farmers to be interviewed was done by the Chinese hosts, with only limited input by the investigator other than general location. The sample obviously is non-random.
4. One Chinese yuan (dollar) equals .27 U.S.
5. One mu equals 1/15 of a hectare or 1/6 of an acre.

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