China Economic Review 30 (2014) 279–289

Contents lists available at ScienceDirect

China Economic Review

The impact of intensive farming on land tenure: Evidence from Confucius' manors (1759–1901)

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ARTICLE INFO

Article history:
Received 4 June 2013
Received in revised form 28 July 2014
Accepted 28 July 2014
Available online 12 August 2014

JEL classifications:
N55
O33
O13
Q15
Q16

Keywords:
Double cropping
Sharecropping
Fixed-rent tenancy
Intensive farming

ABSTRACT

During the Ming and Qing Dynasties, fixed-rent tenancy gradually replaced sharecropping as the dominant form of land tenancy in China. This paper hypothesizes that the secular shift in land tenure was an adaptation to the change in land utilization system towards more intensive cropping. To test the hypothesis we exploit a dataset gathered from the rent collection archives of Confucius' Lineage in the Qing Dynasty. We estimate the effect of the adoption of wheat–soybean double cropping on the choice of tenancy contract, share contract versus fixed-rent contract. We find that double cropped plots were 23.7% more likely to be managed under fixed-rent contracts than annually cropped plots. Our findings are consistent with the implications of the factor endowment theory. The adoption of double cropping made farming more complex and placed greater demands on managerial inputs of tenants. In the absence of a factor market for managerial ability, optimal tenancy contract had adapted to provide tenants with a greater incentive to supply managerial inputs than had been the case in sharecropping arrangements.

1. Introduction

China's population grew massively in the preindustrial period. According to Dwight Perkins' estimation, between the late 14th century and the mid-20th century, there was an 8–10 fold increase in China's population (Perkins, 1969). During the period that population grew dramatically, China's arable land increased only slightly (Maddison, 2007). The pressure of population upon land was a fundamental challenge. To extract more food per hectare, many areas replaced extensive land utilization systems with intensive land utilization systems. Multiple cropping, intercropping, crop rotation, and other land-saving methods were widely adopted across the country.

Population growth can be a key driver of technological change and institutional change in agriculture (Boserup, 1965). Population growth alters the relative prices between labor, land and capital, thus generates new economic problems and leads to institutional changes (North and Thomas, 1971). This paper is situated in the Boserup-North theoretical framework. The paper strives to explain a secular shift in agricultural institutions in preindustrial China. While agricultural production became increasingly intensive in response to population growth, fixed-rent tenancy gradually replaced sharecropping as the dominant form of tenancy.

The shift from sharecropping systems to rental systems has been documented by many China historians (Gao, 2005; Huang, 1991; Li, 2007; Yang, 2009). Sharecropping was the dominant tenure system in agriculture before the Ming Dynasty, and gradually declined

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http://dx.doi.org/10.1016/j.chieco.2014.07.011
1043-951X/

thereafter (Fang, 2000). Various historical evidences support this finding. For instance, the archives of the Qing Ministry of Justice demonstrate a declining percentage of share tenancy contracts in lawsuits over land leases (Yang, 2009). The majority of sample contracts contained in agricultural guidebooks were rental contracts as opposed to share contracts during the Ming and the Qing period (Li, 2007).

This paper hypothesizes that the secular shift in land tenure was an adaptation to the change in land utilization systems from less intensive cropping systems to more intensive cropping systems. As Boserup (1965) argues, "The gradual development to more intensive agriculture, under the pressure of increasing populations, was accompanied by a development of land tenure which was basically similar despite local variations in many points of detail." The fact that new cultivation systems led to adaptation of land tenure has been documented by historians. In Southern Song (10th–12th century) "surviving records show that the fixed-rent system for public land was introduced in a given district after the adoption of the rice–wheat double-cropping system" (Chao, 1986). In the Ming and the Qing dynasties the labor-intensive farming methods and the spread of high-yielding varieties led to changes in land tenancy (Li, 2007).

The adaptation of land tenure to land utilization systems also implies a spatial pattern in land tenure across China. Fixed-rent payment was more popular than sharecropping in the regions that adopted more intensive cultivation methods. For instance, Rawski (1972) notes that the labor-intensive rice cultivation systems led to rental arrangement favorable to tenants and sometimes gave tenants perpetual cultivation rights. According to Buck's land survey in the 1920's and the 1930's, rental systems were prevalent in southern China that adopted intensive multiple cropping (e.g. double cropping rice and rice-tea). Sharecropping was more popular in northern provinces that adopted extensive cultivation systems (e.g. winter wheat–sorghum and spring wheat). The percentage of share tenancy was 12% in double cropping rice area and 10% in rice-tea area. By contrast, the percentage of share tenancy was 44% in winter wheat–sorghum areas and 31% in spring wheat areas (Buck, 1955).

The rationale of the hypothesis rests on the factor endowment theory (Alston & Higgs, 1982; Eswaran & Kotwal, 1985). In traditional Chinese agriculture, managerial ability was an important factor input for agricultural production. However, the market for such a factor was highly imperfect due to low human capital and slow diffusion of agricultural knowledge. An effective way of inducing managerial input as an alternative to obtaining from the market was to offer self-monitoring incentives to the owner of managerial skills. In agricultural production, landlords provided long-term infrastructure management, while tenants provided day-to-day farming management. Switching to more intensive cultivation systems, day-to-day farming activities became more complex and required more managerial inputs from tenants. To induce more managerial inputs from tenants, optimal tenancy contract had adapted to provide tenants higher incentives. Fixed-rent tenancy better suits intensive cultivation systems than share tenancy.

To illustrate the adaptation of land tenure to land utilization systems, we focus on one particular cropping system in northern China, wheat–soybean double cropping. We exploit a micro dataset to estimate the effect of this newly introduced cropping system on the choice of land tenancy contract in the Qing Dynasty. Focusing on a small region enables us to control many factors, such as climate, geographical conditions, measurement systems and local property norms. Our data is gathered and digitized from the manorial archives of Confucius' lineage, one of the biggest feudal landlords in Chinese history. Using land tenure information from the dataset, we find that fixed-rent tenancy constituted over ninety percent of the total tenancy contracts when wheat-soybean double cropping was widely adopted. In a multivariate probit model that estimates contractual choice, we estimate that double cropped plots were 23.7% more likely to be arranged under fixed-rent tenancy than annually cropped plots.

It should be noted that our hypothesis is not incompatible with the existing theories that explain contractual mix in agriculture. Rather, we provide a complementary hypothesis that could explain the long-term structural change in agricultural institutions based on variations in land utilization systems. We believe that the factors emphasized by existing theories, such as risk sharing and transaction cost, may still be determinants of the selection of land tenancy contracts. However, the difficulty faced by these theories is to convince people that the incentive of risk sharing and transaction cost had significantly changed in preindustrial China to such a degree and in such a wide scope that sharecropping was almost completely substituted by rental systems in many places. By contrast, the ultimate presumption of our hypothesis is the dramatic increase in population in preindustrial China, which is a fact that has been unanimously recognized by historians.

The paper is organized as follows. Section 2 provides the history of wheat–soybean double cropping. Section 3 introduces the background of Confucius' lineage and describes the land tenure systems. Section 4 presents the empirical test. Section 5 discusses the alternative hypotheses. Section 6 presents theconclusion.

1.1. History of wheat–soybean double cropping

Wheat–soybean double cropping began to spread in northern China during the late Ming period through the early Qing period. It refers to planting soybeans directly into wheat stubble after wheat harvest. The exact date of invention of the cropping system, like many other cultivation systems, cannot be determined. Some evidence shows that the cropping system was never described by agriculturalists until the Ming Dynasty. According to Chinese agricultural guidebooks, before the Ming Dynasty, all soybean varieties were full-season soybeans rather than the late-maturity summer soybean varieties used for wheat–soybean double cropping system. Thus, the invention of the system may not be earlier than the Ming Dynasty.

Wheat–soybean cropping system was a combination of crops based on rational choice. Winter wheat was central to most cropping systems in northern China, because 1) wheat was one of the few crops that can endure the cold winter in northern China and 2) the price of wheat was higher than most other coarse grains. Late maturity varieties of soybean were an ideal secondary crop in the double cropping system. First, the nitrogen fixation function of soybean can raise the fertility of land.[1] Because fertilizers were costly, Chinese

[1] Li (1995) explains why summer millet wasn't the ideal second crop after wheat harvests. The yield of summer millets was much lower than that of summer beans. Millet also depletes land faster.