



Is It Time for China to Implement Its Rural Revitalization Strategy? A Historical Review and Theoretical Test



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Abstract

China's economy entered a new stage with the abolition of the agricultural tax in 2004, followed by a series of agriculture-supporting policies. Many scholars claim that China has now entered a new stage of industry supporting agriculture. Setting econometric assumption, this paper has empirically tested the hypothesis of industry supporting agriculture. Unfortunately, the results show that China is still standing at the stage of agriculture supporting industry. This is because agriculture or rural still supports industry or urban development by providing large quantity of cheap labor and land, though China has already abolished agricultural tax. Therefore, China should clearly find the evidence of industry supporting agriculture and accurately understand the relation of industry and agriculture so as to implement its rural revitalization strategy.

Keywords: Rural Revitalization; Industry supporting agriculture; Industry-agriculture relationship

Abbreviations: Agriculture-Supporting-Industry (ASI); Agriculture Supporting Industry (ASI); China National Knowledge Infrastructure (CNKI); Household Responsibility System (HRS)

Introduction

The evolution of the urban-rural relationship in China has been characterized by the influence of governmental policies over time, which have long been urban-biased both politically and economically [1] (Zhao and Yin, 2006). Since the 1970s, China has conducted three major adjustments of its agricultural policy: the adoption of the Household Responsibility System (HRS) in 1977; the abolition of agricultural tax in 2004, accompanied by a series of subsidy agriculture-supporting policies; and the Rural Revitalization Strategy proposed in 2017. Academically, it is widely agreed that the first adjustment, the HRS, greatly motivated farmers and promoted the fast development of agriculture [2-4]. The success of the second adjustment, especially the direct subsidy for grain producers, has been controversial [5]. Based on the evaluation of the effects of subsidy policies, Wang and Xiao [6] & Cao and Zhang [7] find that such policies either have no influence on grain production and agricultural inputs or have diminishing effects [8]. As a result, current agricultural subsidy policies have many problems and need to be adjusted [9-12].

The second adjustment of the agricultural policy created a shift in China's industry-agriculture relationship. Many scholars claim that China has shifted from Agriculture-Supporting-Industry (ASI) to Industry-Supporting-Agriculture (ISA) [13], which will necessitate new agricultural policies [14]. Chen [15] further interprets the policy guidelines of "industry promoting agriculture" and "cities leading rural areas", while Yin [16] proposes theoretical innovations in agricultural policies. Some researchers believe that China's industrialization is at a middle stage, theoretically, in the study on the related mechanisms, paths, and modes of ISA.

In 2017, the 19th National Congress of the CPC put forward the Rural Revitalization Strategy, which stresses the crucial importance of issues related to agriculture, rural areas, and farmers, and proposes the plan of prioritizing agricultural and rural development, establishing the policy system and mechanism of urban-rural integrated development, and promoting agricultural and rural modernization according to the general requirements

of industrial prosperity, ecological livability, civilized social ethos, effective governance, and affluent livelihood. This strategy indicates a major policy change in the industry-agriculture and urban-rural relationships in China. Accurately understanding the current situation and the features of China's industry-agriculture relationship is of both theoretical and practical importance for exploring a successful path for rural revitalization in China.

To achieve the objective above, the next section reviews the literature on China's industry-agriculture relationship, followed by an investigation of the evolution of the industry-agriculture relationship in section three. Section four reviews the changes in the patterns of ASI, followed by a theoretical test of ISA with empirical evidence in section five. The last section concludes with some policy implications.

Literature on China's Industry-Agriculture Relationship

China's national economy was founded on a typical dual-sector economic structure of agriculture supporting industry and rural areas supporting urban areas. From the beginning of the economic reform in the late 1970s to the end of the 1990s, many studies focused on agriculture's contribution to industry (ASI). After 2000, especially after the abolition of the agricultural tax in 2004, the research focus switched from agriculture supporting industry (ASI) to industry supporting agriculture (ISA) and urban areas supporting rural areas. Generally, research on China's industry-agriculture relationship can be divided into two distinct periods, ASI and ISA, which are characterized by opposite theoretical views. Literature on these two periods will be reviewed in this paper in order to understand the current status of the research.

We define the late 1970s (the beginning of China's economic reform) to the late 1990s as the first stage of China's industrialization. For this period, the research focus is uniquely on the theory of agriculture supporting industry. The studies include China's tripartite economic structure (i.e., agricultural sector, rural industrial sector, and urban industrial sector) of the time [17]; the related transfer of surplus agricultural labor [18]; the relationship between agricultural surplus and industrial development [19]; the fundamental role of agriculture in the 20 years of reform [20]; the effect of "price scissors" between industrial and agricultural products, along with development trends (Yan et al., 1990); the amount of capital accumulation provided by agriculture to industry [19]; and the transforming trends of the dual-sector economic structure [21]. Note that the term "price scissors" basically means that the sale prices of agricultural products are lower than their real values, while the sale prices of industrial products are higher than their real values.

We define the period between the abolition of the agricultural tax in 2004 and the Rural Revitalization Strategy in 2017 as the

middle stage of China's modern industrialization. During this period, the research focus shifts to ISA. For example, the majority of the 17868 articles on this issue listed on the China National Knowledge Infrastructure (CNKI) website show a rising call for policy adjustments. Specifically, Wu & Li [22] analyze the push-pull effect of industry, and Ke [23] points out that the policy guidelines should be fully implemented. Other researchers focus on related theories and policies [24-27]; inherent mechanisms of industrialization, urbanization, and agricultural modernization and their relationship [28-34]; and the mechanisms, paths, and modes of ISA [26,28, 35-38]. Ma et al. [39] study international experiences and China's policies; Guo [40] recognizes the relationship between China's industrialization and agricultural development from the perspective of the Malthusian population trap and endogenous economic growth.

In terms of China's dual/tripartite economic structure, many scholars investigate the evolution of the industry-agriculture relationship and the corresponding policies. Wu [28] analyses the evolution of the urban-rural relationship of China over the 1949-2006 period; Sun [41] studies the industry-agriculture relationship and economic growth during the 1953-1978 planned economy period; Xie & Jiang [42] analyze the historical evolution and general features of the urban-rural relationship; Zhou & Song [43] empirically study the inclusive growth theory of China's agricultural economy; Cheng & Zhu [44] review China's agricultural subsidy system and related policy options in the middle stage of industrialization; Yu [45] advocates a dual structure to support land-lost farmers; Yang et al. [46] analyze the institutionally restrictive factors in the course of China's synchronized development of industrialization, informatization, urbanization, and agricultural modernization.

The literature review above shows that after the abolition of the agricultural tax in 2004, China entered the ISA stage. Many researchers have pointed out that technological capabilities and innovation are the key to promote industrialization and to escape the "middle-income trap" [47,48]. The innovation-driven optimization and upgrading of the industrial structure [49] and the transformation of the development mode led by the original technological progress [50] are both necessary to support the National Rural Revitalization Strategy for the next three decades in China.

Theoretical Hypotheses of Industry Supporting Agriculture

Industry supporting agriculture is a general summary of a critical period of role-exchange in the evolution of the industry-agriculture or urban-rural relationship. Obviously, it is important for policy-makers to understand the role-exchange between supporting and being supported. However, to judge whether

industry is achieving this goal is difficult and controversial, especially, for different countries or regions that need different criteria. Therefore, this paper empirically tests two theoretical hypotheses of ISA because the practical characteristics of industry supporting agriculture are more easily observable and feasible.

Hypothesis I: The advent of marginal substitution of agricultural machinery for labor. Economically, substitution between different production factors is determined by the relative price between factors. In other words, when a specific factor becomes expensive and the total cost increases, producers will seek an alternative factor for substitution. Specifically in agriculture, with rising labor costs, producers will normally use more machinery to substitute for labor. In this case, with total yield unchanged, the marginal cost of the agricultural machinery must not exceed that of the labor substituted; that is:

$$\Delta K \times P_K \leq \Delta L \times P_L \quad (1)$$

where K is machinery, L is labor, and P is price. In other words, the Marginal Rate of Substitution (MRS) of agricultural machinery for labor ($\Delta L / \Delta K$) is not less than the inverse price ratio P_K / P_L , which can be expressed as:

$$\Delta K \times P_K \geq \Delta L \times P_L \quad (2)$$

Equation (2) means that if the substitution of machinery for labor has appeared, there is an advent that the industry sector is supporting the agriculture sector, or the urban areas are supporting the rural areas. Hypothesis II: The advent of substitution of machinery for labor. A fundamental characteristic of industry supporting agriculture is the substitution of machinery for labor, by increasing the machinery input while decreasing the labor input, or achieving an elasticity of substitution of machinery for labor that is larger than one, which can be expressed as follows:

$$\varepsilon = (\Delta K / K) (\Delta L / L) \quad (3)$$

Where ε is the elasticity of substitution of machinery for labor. When ε is larger than one, the more labor input will be saved if increasing one unit machinery input, while when ε is less than one, the less labor input will be saved if increasing one unit machinery input. In addition, when ε is larger than one such agricultural mechanization is expected to improve agricultural productivity, increase farm profitability, and reduce the impact of rural labor outflow [51].

Empirical tests of industry supporting agriculture

Test of Hypothesis I

Table 1: Marginal substitution of agricultural machinery for labor.

Year	P_K	P_L	ΔL	ΔK	$\Delta L / \Delta K$	P_K / P_L
1981	85	77	-488	1367	-0.36	1.1
1985	100	100	-262	1415	-0.19	1
1990	145	117	-5689	641	-8.88	1.24
1995	241	167	1098	2316	0.47	1.44
2000	224	223	-274	3577	-0.08	1.01
2005	217	298	1388	4370	0.32	0.73
2006	220	327	1501	4124	0.36	0.67
2007	224	343	1210	4067	0.3	0.65
2008	244	372	808	5601	0.14	0.66
2009	246	429	1033	5306	0.19	0.57
2010	250	524	960	5284	0.18	0.48
2011	261	631	1336	4954	0.27	0.41
2012	267	860	821	4824	0.17	0.31
2013	268	1012	1602	1348	1.19	0.26
2014	270	1090	1381	4150	0.33	0.25
2015	269	1126	871	3672	0.24	0.24
2016	270	1158	423	-14483	-0.03	0.23

Notes: $\Delta L = L_t - L_{t+1}$, positive values indicate a decrease in agricultural labor compared with the previous year; $\Delta K = K_{t+1} - K_t$, positive values indicate an increase in the total power of agricultural machinery compared with the previous year; P_K is the price index of agricultural machinery with 1985 as the base year, P_L is the wage (Yuan per day) variation index with 1985 as the base year; K is the total power of agricultural machinery (unit: 10^4 kW); L is the number of labor engaged in agriculture (unit: 10^4).

Data source: P_L is calculated based on statistics from *Compilation of Cost and Income Data of Agricultural Products in China*, National Development and Reform Commission; other data are from *China Statistical Yearbook [NBS], 2017*.

As shown in Table 1 (last two columns), in most years, the MRS ($\Delta L/\Delta K$) of agricultural machinery for labor was less than the inverse price ratio (P_K/P_L). This result indicates the unsatisfactory effect of machinery substitution for labor, suggesting the industrial sector's incapability to provide cost-efficient machinery for the agricultural sector. In fact, Lin et al. [52] finds that machinery input in the agricultural sector has not significantly increased with the rising rural labor cost in China. This could possibly partly explain the fact that despite the sharp decline of the share of agricultural employment, the productivity of China's agricultural sector is still substantially low [53].

While it is noted that between 2013 and 2015, the MRS of machinery for labor ($\Delta L/\Delta K$) stayed above the inverse price ratio (P_K/P_L), which suggests that machinery substitution for labor has occurred, theoretically, meaning that the industry sector

supported the agricultural sector, this was not the situation in 2016. As a result, machinery substitution for labor needs further observation and analysis for China.

Test of Hypothesis II

As shown in Table 2, in most years before 2005, the elasticity values were negative, which may suggest a complementary relationship between machinery and labor, or insufficient inputs of factors. The elasticity of machinery substitution for labor became positive after 2005, but still remained below 1 for most years, indicating an insignificant substitution effect of agricultural machinery for labor. In other words, such substitution actually never occurred in most years. The possible explanation for this period is that the large outflow of rural labor is actually a result of the surplus of rural labor itself.

Table 2: Agricultural machinery's elasticity of substitution for labor.

Year	Total power of agricultural machinery	Large and medium-sized tractors	Small-sized tractors
1980	-0.181	-0.16	-0.155
1985	-0.124	4.616	-0.061
1990	-6.55	3.428	-2.33
1995	0.482	-0.974	0.653
2000	-0.112	-0.147	-0.15
2005	0.65	0.209	0.881
2006	0.806	0.251	1.797
2007	0.763	0.236	1.244
2008	0.396	0.087	0.45
2009	0.59	0.241	2.197
2010	0.603	0.332	1.759
2011	0.991	0.457	3.573
2012	0.677	0.347	-4.079
2013	5.11	0.836	-2.584
2014	1.578	0.841	-4.657
2015	1.209	0.613	-2.532
2016	-0.132	0.334	-1.047

Notes: Elasticity is defined as $[(L_t - L_{t+1})/L_t] / [(K_{t+1} - K_t)/K_t]$, where L is the number of labor engaged in agriculture (unit: 10^4) and K, respectively, is the total power of agricultural machinery (unit: 10^4 kW) and the numbers of large and medium-sized tractors, and small-sized tractors. L is assumed to decrease year by year and K increase, therefore positive values indicate substitution of machinery for labor while negative ones indicate compensation relations.

Data source: China Statistical Yearbook [NBS], 2017.

Similarly, it should be noted that between 2013 and 2015, the substitution elasticity of agricultural machinery was larger than one, showing a general capability of effective substitution for labor. However, in 2016, this elasticity fell below one. Specifically, substitution elasticity of large- and medium-sized tractors was below one, showing limited substitution effect of this type, while substitution elasticity of small-sized tractors was negative for most years, indicating a complementary relationship between small-sized tractors and labor. In addition, the elasticity of substitution of agricultural irrigation diesel engines widely fluctuates, showing equally significant substitution and complementary effects.

Conclusion and Implications

This paper has reviewed the literature on the industry-agriculture or urban-rural relationship over time, and empirically tested the possibility of industry supporting agriculture in China. The general conclusion is that there is some uncertainty whether industry supports agriculture in China. Therefore, more evidence is needed. Below are several points and policy implications from this exercise.

First, the “rural decline” is an outcome of urbanization. Such decline is globally inevitable as urban expansion draws more labor, land, and capital from the agricultural sector [54,55], especially during the initial accumulation stage of urban development and as a result of the dual economic structure. Therefore, preventing rural areas from declining means altering the dual economic system and improving other urban-biased policies regarding land, education, medical care, and social security [46], especially those for migrant workers [56].

Second, agriculture supporting industry has changed over time. Previous research focused on agricultural product surplus and cheap rural labor, rather than the real reason for rural decline. In this paper, we argue that it is the outflow of production factors that cause rural areas to decline. Therefore, preventing rural areas from declining means returning production factors to rural areas, especially human capital.

Third, the essence of the rural revitalization strategy is industry supporting agriculture. The industrial sector’s productivity is crucial to the expansion and development of the agricultural sector as well as the rural labor flow [57]. As previously stated, the industry sector should provide the agricultural sector with cost-efficient agricultural machinery. Therefore, implementing the rural revitalization strategy is dependent upon the industry sector, especially the manufacturing sector [58-60].

Fourth, China is in the transitional period between agriculture supporting industry and industry supporting agriculture [60-65]. As such, China does not need to rush into rural revitalization, but

does need to prepare itself for this to transpire.

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