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## Abstract

China’s (or East Asian) highly crop-based agriculture generates high seasonality in demand for labor across the year, leading to the rise of agricultural and handicraft side-employment. In contrast to the “involution” thesis which posits a Malthusian trap with diminishing return in Chinese agriculture dictated by deteriorating land-labor ratio, this paper presents stylized empirical facts from 19-20th century Chinese (and Japanese) agriculture and theoretical models to demonstrate that this labor relocation across the seasons contributes to a Boserupian type of growth. It leads to rising commercialization and population density, but not necessarily urbanization, rising productivity and structural change. Ultimately, industrialization and the expansion of markets that occurred outside agriculture pulled China (and Japan) out of the “involution” to embark on modernization.



JEL Classification: N55, O13, O44, O53

Keywords: Chinese agriculture, involution, Malthusian, Boserupian



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# "Involution" or Seasonality: a New Perspective on the 19-20th Century Chinese Agricultural Development

What defines the long-run macro trends of Chinese agricultural output and productivity? What is the micro-aspect of the choice of technology, combination of factor use and household production and management decisions? These central questions of Chinese agriculture are at the core of the debate on the nature of the Chinese economic history and the Great Divergence.

China's long-run deterioration in land-labor ratio have given rise to Malthusian type of interpretation of Chinese agriculture in the form of the so-called "high level equilibrium trap" hypothesis proposed by Mark Elvin. In particular, the "involution" thesis a la Philip Huang posits a largely pessimistic vision of a long-run decline in agricultural productivity and output per capita in the face of resource constraints and over-population. However, the more optimistic vision as recently championed by the California school posits that Chinese agricultural expansion, particularly in the highly-developed Lower Yangzi area, had proceeded in a distinctive technological and institutional trajectory from the well-known British or Western European model. In agriculture, efficiency came from gains in the use of better fertilizers, rationalization of resource use, agricultural intensification and cash-crop cultivation. This technical bias induced by the Lower Yangzi's relative factor endowment, and combined with the expansion in regional trade and geographic division of labor constituted what they viewed as Smithian growth.[1] To certain degree, the technical aspect of the California school thesis is a variation of the Boserupian classification (a la Ester Boserup) of long-term economic growth that viewed resource constraints more optimistically as a stimulus to technical change and intensification (Boserup 1965). Here, by expanding and developing an analytical framework from the insights of Mark Elvin, Philip Huang and Kang Chao, we show that a more rigorous Boserupian reformulation of these hypotheses sheds new insights on the debates and reveals

[1] The articles of debate can be found in May 2002 (61, No.2) issue of *Journal of Asian Studies.* For an earlier debate around the 1990s on whether or not there were improvements in agricultural productivities and living standards in Chinese agriculture for the early 20th century between Philip Huang and Thomas Rawski, Ramon Meyers, see chapter 6 in Philip Richardson, 1999.

the resilience of traditional Chinese agriculture beyond the Malthusian trap.

We argue that a critical issue neglected in the discussion is the function of subsidiary or sideline production as an intertemporal labor re-allocation mechanism to deal with the high agricultural seasonality due to China's monsoon climate. This paper presents stylized empirical facts from 19-20$^{th}$ century Chinese (and Japanese) agriculture and theoretical model to demonstrate that this labor relocation across the harvest and idle seasons contributes to a Boserupian type of growth with rising commercialization and population density, but not necessarily urbanization, rising productivity and structural change. Ultimately, it was industrialization and the expansion of markets, developments that occurred outside agriculture that pulled China (or Japan) out of the "involutionary" path and took China onto a path of modern economic growth.

## 1. Stylized Facts of Seasonality in Chinese Agriculture

In comparison at least with Western Europe and North America, two interrelated features of Chinese (and East Asian) agriculture standout: seasonality and a predominantly crop or grain-based economy. In China, the two main agricultural zones are the wheat cultivation in Northern China along the Yellow River and rice culture along the Yangzi river and below. Figure 1 demonstrates the much greater seasonable variation in rainfall compared with Western Europe (Lu Feng 2004). Table 1 provides average rainfall and standard deviation.

According to Lu Feng, the much greater seasonal fluctuation had a huge impact on Chinese agriculture as it generated intense demand for agricultural labor during the much-shortened peak season and in turn placed severe constrains on the average size of household farm and the nature of agricultural production. For example, in Northern China, the harvest period of winter wheat agriculture and sowing period of spring winter ranged 15-20 days and less than 25 days respectively. In Western Europe, the sowing period for most crops would be around two or three months. (Lu Feng 2004, p. 442). The severe demand required for labor within a short window of time meant that smaller and intensive farming was far more viable in this context.

**Figure 1. Rainfall data in Western Europe and China**

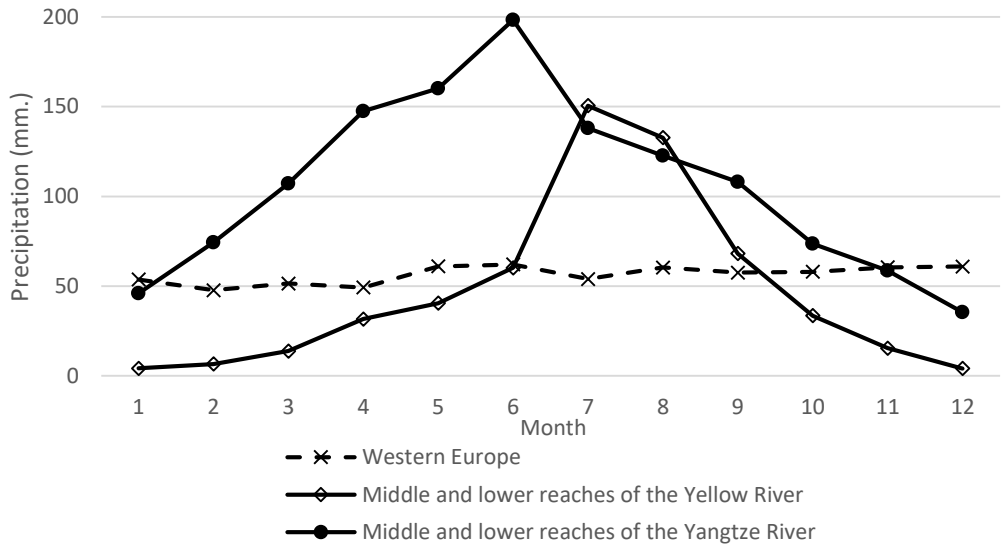


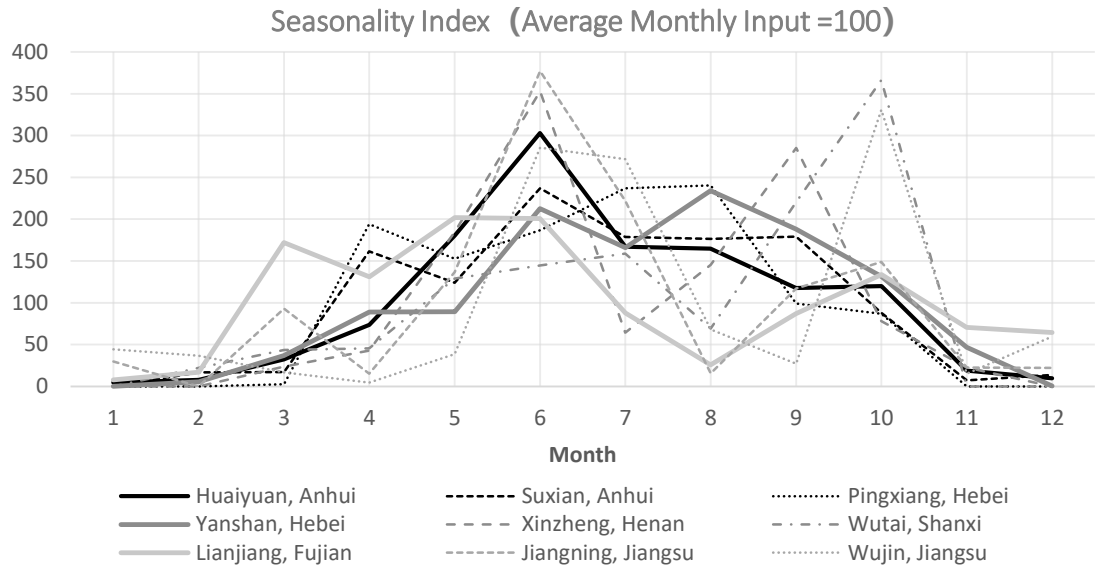

**Table 1. Summary Statistics of Rainfall Data**

| | Average | Standard Deviation | Coefficient of Variation | Max-Min difference |
|---|---|---|---|---|
| Western Europe | 57.21 | 5.14 | 0.09 | 15.13 |
| Middle and Lower Yellow River | 47.83 | 49.08 | 1.03 | 148.1 |
| Middle and Lower Yangzi River | 106.15 | 49.77 | 0.47 | 161.58 |

We can present data on labor use across the year that reveal the impact of rainfall on the seasonality of agricultural production. Figure 2 presents a sampling of agricultural seasonality in labor use across Northern and Southern China from the data compiled by John Buck in his 1930s survey. It shows clearly the pronounced peak seasons around the month of June and Oct. across different regions, whereas labor inputs were extremely low in the early and final part of a 12-month cycle over the year. While we do not have exactly comparable data for Europe and US, Figure 3 shows that seasonality in the US is far less pronounced owing partly to less seasonality in grain production but more importantly to the much higher share of animal husbandry. Even in the case of US, the most pronounced pattern of seasonality is cotton cultivation in the American South.[2]

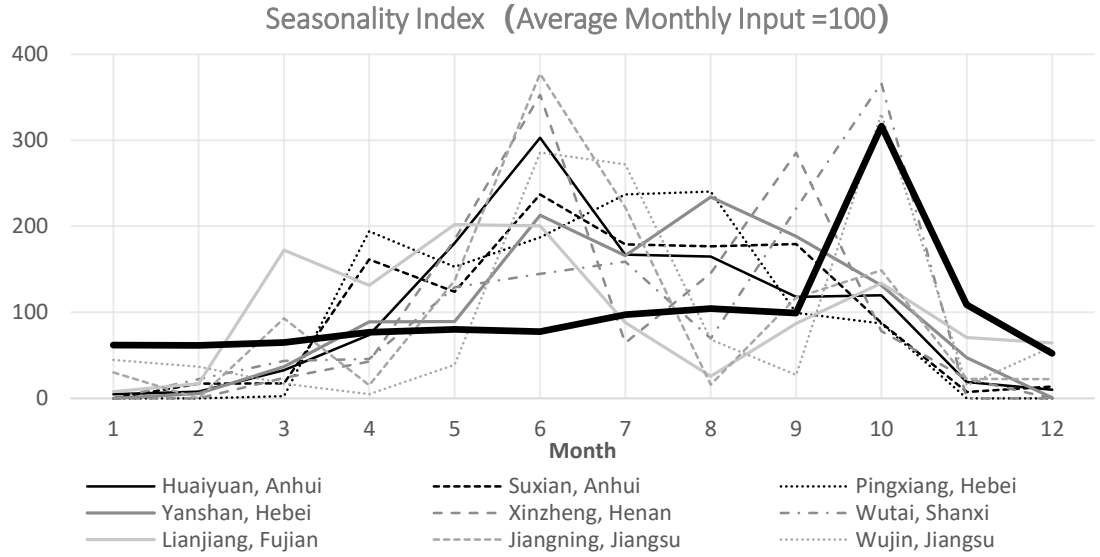
[2] See Scott A. Redenius and David F. Weiman 2011 and Ralph V. Anderson and Robert E. Gallman 1977 on the question of seasonality in American cotton cultivation.

**Figure 2. Agricultural Seasonality Index in Rural China in the 1930s**




Source：Buck (1936), pp. 339-380.

**Figure 3. Seasonality in comparison with U.S.A**




Notes: The data is from Western New York State, the Oct. peak period is for picking fruit. Data is from Yearbook of the United States Department of Agriculture (Washington: G.P.O., 1895-1923), p.543. We want to thank Paul Rhode for supplying us this data source.

Such pronounced differences in seasonality would reveal themselves in patterns of wages

across the season. We first illustrate the impact of agricultural seasonality by showing the inverse relationship between daily agricultural wages and the percentage of idle time throughout a year in Northern China in Figure 4.

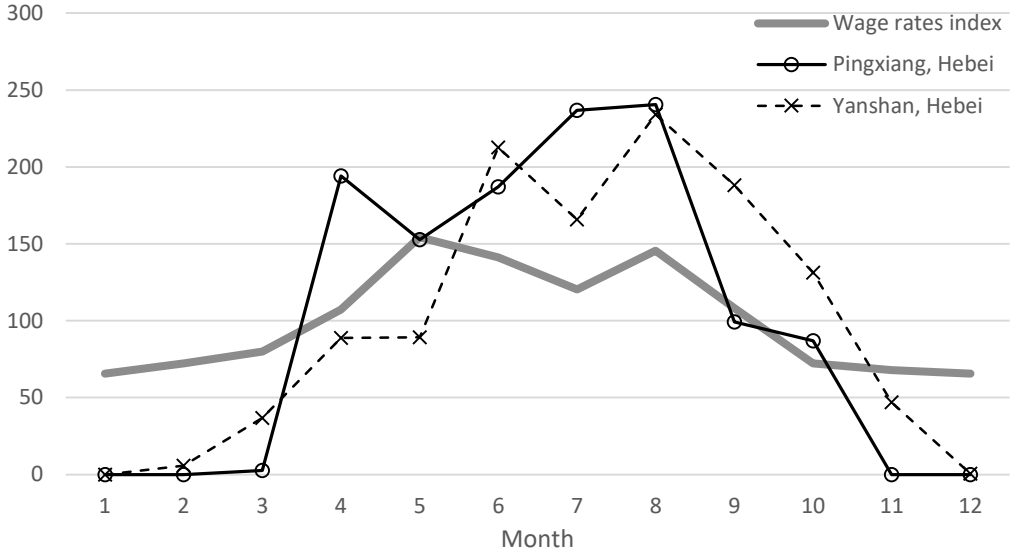
**Figure 4. Percentage Share of Idle Time (left axis) and Wage rates (units of copper cash on right axis)**


Source notes: Percentage share of idle time of farmers from Buck (1937), p.296, Wage rates (1807-1858) from Sidney Gamble (1943).

As the wage series by Sidney Gamble comes from Hebei province, we plot in Figure 5 his wage series against the agricultural seasonality index of the two Hebei counties in the Buck data. The pattern is in striking synchrony except that the wage series were much smoother than the seasonality index. Most noticeable is the months of January and February, November and December that are almost completely idle in terms of labor use. However, the wage rates during those months hovered far above zero. This fact, as we will argue, is exactly the labor reallocation mechanism at work where peasants consciously relocate sideline or household production during these idle months, which allowed wages above zero. Clearly, the wage rate presented in the Figure is an equilibrium outcome achieved after smoothing the seasonal marginal product differentials across the months through the labor reallocation between agricultural mainline and sideline activities.

**Figure 5. Wage Rate Index and Agricultural Seasonality Index in Hebei Province**

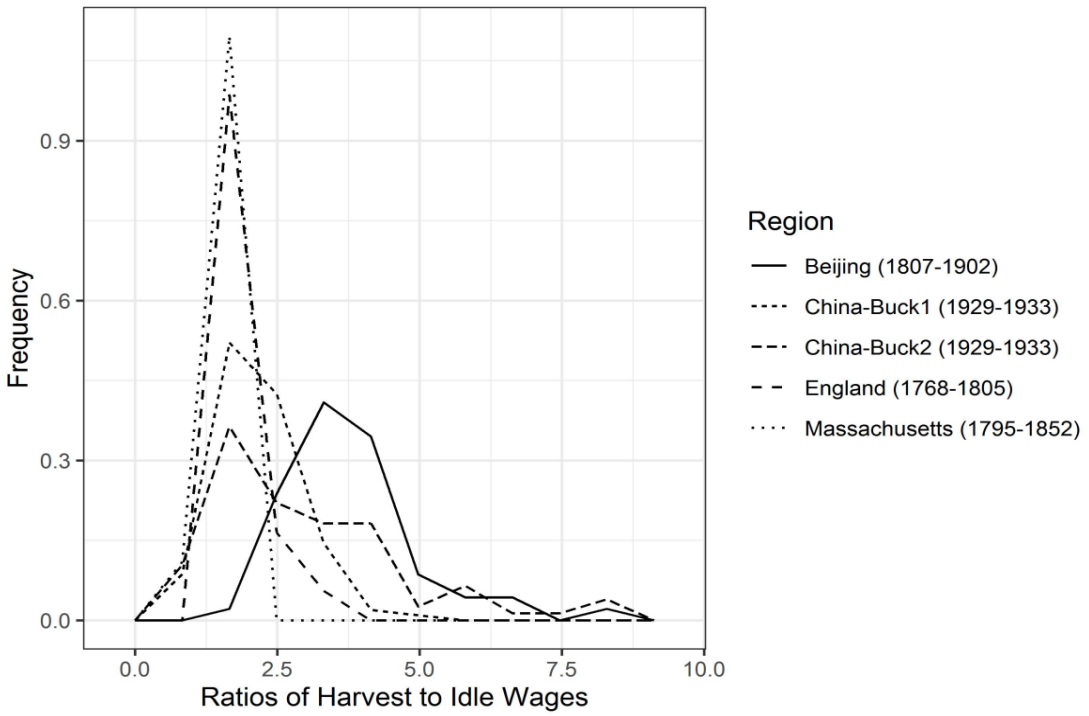
**(monthly average)**




The surveys conducted during the 1920s reveal that the harvesting wages were undoubtedly the highest, reaching between two and three times of that of annual average. This ratio would have been even higher if it were calculated just between harvest and idle seasons (T'ao Meng-ho, *China Labor Yearbook*, 1928 pp. 539-547). According to research by Peng Kaixiang (2015, pp. 90-98), the harvest wages used by Gamble as presented in Figures 4 and 5 are not exactly wages purely for the harvesting labor as they may include other non-agricultural labor during harvest or sowing seasons. There is also no separate calculation of wages for the idle laborers in the Gamble data. Here, we try to derive more exact ratio of harvest to idle wages in order to make an international comparison with English and American harvest to winter wage data compiled by Sokoloff and Dollar (1997). We reconstruct another set of wage data from Buck (1937b). Buck's wage data are in three categories: daily and monthly wages in crop-growing seasons, and annual wages. As daily wages appear more frequently in harvest seasons, they approximate harvest wages (may be a bit more at the lower end of the harvest wages). Annual wages tend to be the lowest when converted into daily terms partly because they include idle periods and partly because long-term workers tend to be much more low-skilled. So, we can take daily wages converted from annual payment as approximating daily wages of idle seasons. We also further construct a second series by deducting that portion of wage during cropping season from the annual income to derive wages for the idle period only (which can be viewed as the lower bound of the idle wages). This wage series labelled as Buck2 in Figure 6

for the ratio of harvest to idle daily wages. Figure 6 plots the density of the ratios of wages of the five different series. It shows clearly wage variation across the seasons near Beijing (from the Gamble data) in the 19th century or across China (from the Buck data) in the 1930s were far larger than those of UK and US before mid-19th century.

**Figure 6. Ratios of Harvest to Idle Wages**



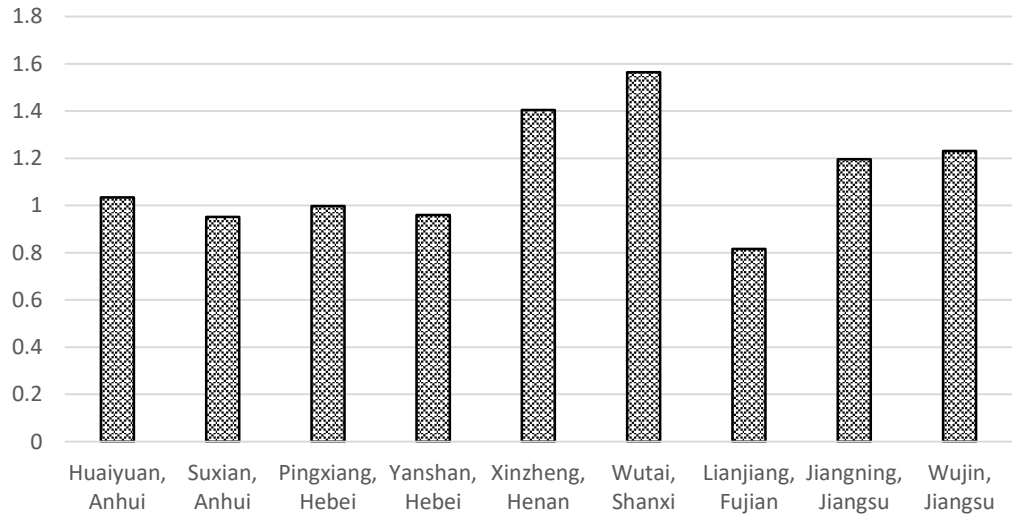

Source notes:

1）The Beijing series is the ratio of Wheat Harvest Rate with the average daily wages between Oct. and next March for each year from 1807 to 1902. Data is from Sidney Gamble (1943).
2）For China-Buck1 and China-Buck2, see explanation in the text.
3）For England and Massachusetts, the data for the ratios of harvest to winter wages is from Sokoloff and Dollar (1997).

Understandably, there is regional variation within China which tended to be lower in Southern China where multi-cropping is more prevalent. The survey data by Buck (1936, pp. 339-380) presents labor use in semi-monthly averages across the year for the 1930s. Figure 7 presents coefficient of variation calculated for all the locations. It shows prominently Lianjiang county of Fujian province in Southeast China having the lowest coefficient of variation, ie lowest seasonality in labor use throughout the year. Indeed, in the double-cropped rice region

of Fujian and Guangdong province, the ratio of daily over annual wages seem to be below two, lower than the average in figure 6 (Buck, 1937b). In fact, cotton cultivation that had been introduced into Fujian and Guangdong earlier than the Lower Yangzi largely stagnated after the 18th century, possibly due to the lower seasonality in labor demand. (Xu, Xinwu, 1992， p.16).

**Figure 7. Coefficient of Variation of Labor Use in Semi-Monthly Frequency**



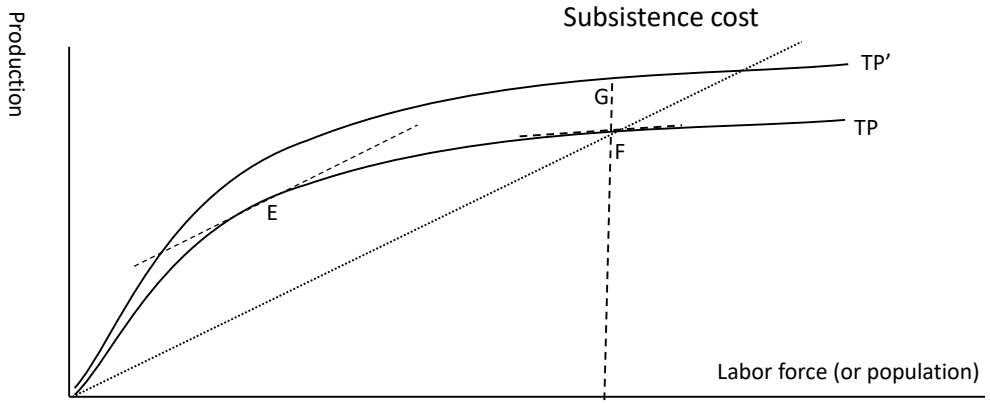

## 3. Paradigms of Chinese Agriculture Revisited in Light of Seasonality

In this section, we seek to clarify several theoretically prominent frameworks used to explain Chinese agriculture. To certain degree, we can more or less capture the idea of diminishing marginal returns in Chinese agriculture due to over-population in a Malthusian framework which have been the main inspiration behind the models by Kang Chao, Mark Elvin (high-level equilibrium trap) and Philip Huang (involution). Figure 8 shows a standard partial agricultural total output (TP) curve with respect to labor. Given fixed land and capital constraint, marginal product of labor declines with increases in total output. Given the subsistence cost, the optimal or output maximizing point will be point E, leaving an agricultural surplus beyond subsistence. In a Malthusian model, whenever Average Product (AP) exceeds average subsistence cost, it will induce a population growth that will eat up the surplus as it pushes agricultural production from point E towards point F at which point average output (AP) is now equated to the average subsistence cost. At point F, marginal product (MP) of labor is far lower than that at point E. As mentioned by Kang Chao, given some degree of income inequality, the

actual Malthusian equilibrium point would tilt towards the left of F, or somewhere between points E and F. Point F also approximates the so-called High Level Equilibrium Trap condition whereas the difference in MPs between points E and F seems to give rise to the claim of "involution" where marginal product in subsidiary production (likely at F) is lower than that in mainline agricultural activity (at E).

In the case of modern agricultural improvement, the Malthusian trap or equilibrium is relieved through a technical innovation of the labor-saving and resource (land) using type (as in the case of British or American type of agriculture, which used inanimate power source and mechanization). This can be indicated by a general upward shift of production function from TP to TP' that raises both Marginal Product (MP) and AP overtime. Clearly, Chinese or East Asian agriculture under severe land-constraint did not take that direction. It was partly based on this criteria that traditional Chinese agriculture were deemed as involutionary or "trapped".

**Figure 8. The base line model of Malthusian framework**




However, as we will show, the California school argues for an alternative path that can be represented in Figure 9. A Boserupian type of innovation in the adoption of labor-using technology and institution would shift TP to TP' in figure 9(a). In the Boserupian model, when population reaches point C, people can opt for a new production function in the form of TP', which is not a general upward shift of production function or an increase in total factor productivities across the board as in Figure 8. However, it does increase total output and absorb more labor as shown by the much larger population size at point D (also see Kang Chao, p. 20-22). By moving AP from point A to D, the Boserupian innovation temporarily releases the

Malthusian threat through a combination of intensive cultivation and greater degree of division of labor and commercialization in response to rising population density.

In figure 9(b), we illustrate the changes using Marginal and Average Product curves. The shift from TP to TP' leads to a shift towards AP' and MP'. If the Boserupian innovation is continuous, it could lead to multiple or constants shifts of TP to TP', which can generate a more general production function that is the envelope of TP and TP'. This envelope expands the production frontier and improves efficiency even though AP' at point D may be lower than AP at point A. As you can see, AP' and MP' at point D represents a drastic improvement over AP and MP had TP not shifted to TP'. Hence, point B represents the dire scenario of Malthusian trap or involution with much larger populations size and deteriorating land-labor ratio.

**Figure 9. The Boserupian Framework**

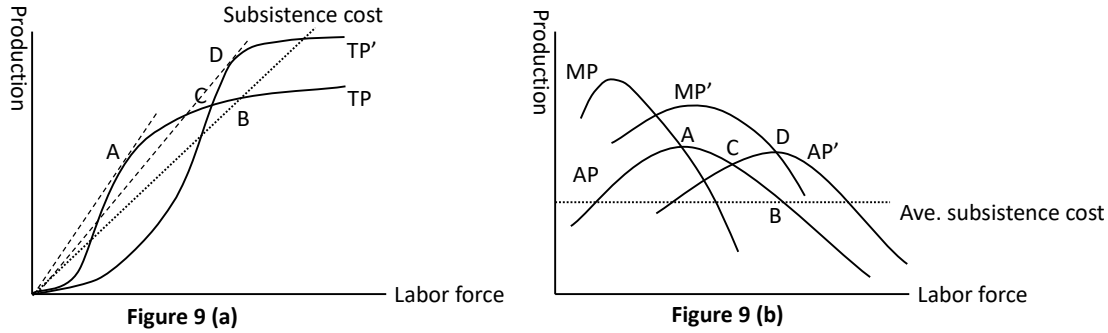



Figure 9 (a) Figure 9 (b)

The Boerupian innovation moving MP to MP' is realized through several channels: the greater application of irrigation, fertilizer and intensive cultivation, which raised land productivity of a single crop or through the intensive multi-cropping and crop-rotation, the introduction of more labor-intensive, profitable cash crops and finally, the shift to agricultural and handicraft sideline production which relies less on the use of land. This shift was often accompanied by an increase in market transactions within agriculture sectors, between the agricultural and non-agricultural sectors, all of which leading to what is often called Smithian growth through the great division of labor and enhanced specialization.[3]

In some ways, one rigorous extension of the Boserupian thesis is the so-called induced innovation theory in the seminal works by Hayami Yujiro and Vernon Ruttan in the 1980s. They marshalled statistical evidence to show how labor-using technological innovation explains the

[3] We want to thank Osamu Saito for alerting us the nuanced distinction between Boserupian and Smithian growth.

successful economic growth of modern Japan under severe factor endowment constraints. It clearly revealed the insufficiency of the simplistic Malthusian framework that ignored the potentials of factor-biased technological progress, factor substitution as well the expansion of trade based on comparative advantage that would prevent the fall in marginal productivity of labor and release the factor endowment constraints (See Yujiro Hayami and Vernon Ruttan 1985, also Shigeru Ishikawa 1981).

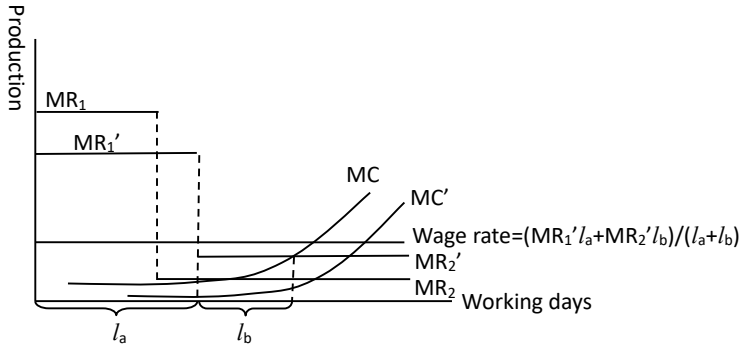
By the 19th century, the potential for raising land yield on a single crop without major modern technological innovation like that of 19-20th century Japan is largely exhausted within China's long-established traditional agricultural regions.[4] We now turn to examine the issue of agricultural sideline production, a longstanding feature of Chinese agrarian system that combines main agricultural production with household handicraft activities. The increasing role of household subsidiary and handicraft production has long been held as the cornerstone of the "involution" thesis that posits over-population pushing agricultural household increasingly into lower productivity activities and ultimately into poverty. The involution thesis finds support in the productivity differential between mainline agricultural (grain) production and handicraft production. However, we now develop a new theoretical framework to interpret the impact of seasonality in Chinese agricultural activities.

Figure 10 shows that in the absence of cash crop cultivation or handicraft, Marginal Revenue of labor is $MR_1$ during agricultural season but drops drastically to $MR_2$. The total number of workdays will be determined by the intersection of Marginal Cost of labor curve and $MR_2$. Now we introduce cash crops or sideline activities such as cotton cultivation. Given that returns to cotton cultivation was lower than in grain cultivation as indicated in the literature, marginal returns to combined activities of grain and sideline activities would be $MR_2$ and $MR_2$',

[4] Although there are slight differences in the application of draft animal and fertilizer, various studies show that yield based a single cropping shows vary little with farm size during the 1930s. The study by John Buck shows that smaller farm size tended to have slightly higher double cropping index and higher yield but the different is not overwhelming. On the other hand, the increasing share in the cultivation of cash crops such as peanuts, tobacco and American cotton due to heightened commercialization could generate higher revenue, flatten the Marginal Revenue or push it further outward. These new findings based on the micro-level data used by John Buck can be found in Hisatoshi Hoken and Qun Su (2019). Also see Ma and Peng (forthcoming) for a summary of these arguments.

which are both lower than $MR_1$ and $MR_1$' respectively. However, the total income based on the $MR_2$ and $MR_2$' may not be necessarily lower than that from $MR_1$ and $MR_1$' for two reasons. Firstly, the total number of workdays have now been extended in the scenario of combined agricultural and sideline activities. Second, $MR_2$', which takes account of the introduction of sideline activities is higher than $MR_2$ during agricultural slack season. Moreover, if the desire of keeping families' livelihood of small farms reduce the marginal disutility of work, this will push the MC towards MC', further extending the workdays annually.[5]

**Figure 10. Agricultural Sideline Production**




## 4. Seasonality and "Involution"

We can now see the insufficiency of the involution argument by Philip Huang which hinges on the simple fact that both $MR_1$' and $MR_2$' are lower than $MR_1$ but ignores that $MR_1$ is only applicable during the agricultural harvest season. The new system of mixed cultivation and sideline production extends the number of workdays at the same time raises the marginal returns during the agricultural slack season. This point itself is also recognized by Philip Huang himself (Huang 2003). Estimates by Bozhong Li also reveal similar tendency. Despites differences in details, Li argues that cotton handicraft required less capital and utilized more woman and children. Even when average cultivation acreage in the Jiangnan region was reduced from 25 mou to 10 between the mid-16$^{th}$ century and 18-19$^{th}$ century, annual household income managed

[5] Data seems to show that the number of idle months vary little with farm sizes. They show only among the very small farm sizes – the bottom 1% of the farms – the number of idle months reach as high as 2.3 months. John Lossing Buck, 1937b, p. 307.

to rise by 15% (Li, 1998, pp. 150-153). Overtime, this combined effect may increasingly dominate the income from pure agricultural income given increasing commercialization, improving transport and rising prices for cash crops that may raise the returns to handicraft and sideline production.[6]

Developed since China's Ming and Qing period, these sideline production and handicraft industries such as cotton spinning or weaving requiring little capital, can be easily tailored to household production by women and children during agricultural slack season. Because of the flexibility across the season, we expect handicraft or agricultural by-employment to act as a critical mechanism for intertemporal labor re-allocation and we could expect productivity differentials between mainline agricultural activities (which exhibit strong seasonality) and sideline (handicraft) production which could take advantage of both idle seasons and slack labor force such as women and children. Pomeranz (2002), for example documents a daily value-added differential of about two to one between grain production and cotton cultivation, spinning and weaving in a joint household production. Interestingly, this value-added differential seems to approximate most harvest idle wage differential as shown in Figure 6. As you will see, the involution argument often interprets this productivity differential as lower or diminishing returns to labor in cotton cultivation or textile handicraft relative to grain or staple production as a result of over-population. Without understanding the role of seasonality, one has to rely on some disequilibrium conditions, imperfect market or even exploitation to explain this value-added differential. By simply highlighting marginal product dipping below average product, the involution argument finds a far more pessimistic picture of Chinese agriculture and living standards even though it recognizes that longer workdays actually led to the rise in total annual household income.

All of these go on to show that the so-called "hidden employment" or "surplus labor" was much more of a seasonal phenomenon that have been increasingly reconciled through the system of combined agro-handicraft eco-system in China. Indeed, in her seminal work, Boserup herself noted the importance of seasonality in crop-based agrarian economy for other parts of

[6] There is no definitive resolution on the empirical evidences supporting either side of the debate. See Li Bozhong (2007), Philip Huang, (1990), Kenneth Pomeranz (2000).

the world: "…The seasonal pattern of work is so pronounced that families who have much more land than they can cope with in the peak season have little to do in most of the remaining part of the year." (Boserup 1965, p.49). In fact, many scholars who did not understand the seasonality factor, according to her, loosely explain agrarian underemployment as a result of overpopulation where in fact low average level of employment found in many monsoon-fed oriental paddy districts is likely seasonal (p. 50-51). Other scholars working on China noted a strong gender component to the seasonality aspect of Chinese agriculture as most handicraft, household and other non-agricultural production done during the idle months is usually taken up by women and to certain extent by children.[7]

**Table 2 Structure of GDP in percentage during 1823-1829**

| | Hua-Lou | the Netherlands |
|---|---|---|
| Primary sector | 30.8 | 24.6 |
| Secondary Sector | 33.2 | 29.1 |
| Tertiary sector | 36 | 46.3 |
| | 100 | 100 |

Source notes: see the text.

In this context, one could actually reframe the so-called "involution" or "high level equilibrium trap" in the Chinese context as akin to what other scholars described "industrious revolution" for pre-industrial Japan and Europe.[8] The similarities and differences between China (East Asia) and Europe should be the subject of further research. Here, as a preliminary illustration, we make use of a fascinating and pioneering comparative study by Bozhong Li and Jan Luiten van Zanden (2012) on the national accounts of a region of the Lower Yangzi in China – the Hua-Lou area – and the Netherlands during 1823-1829. Table 2 presents an intriguing

[7] For example, female labor in Wuxin of Jiangxu province is most intense during cocoon rearing season but rarely participated in agricultural mainline activity. Female laborers mainly engaged in cotton handicraft production for much longer period but also helped with agriculture work during harvesting season (Wang 2015). Also see Li (1998 and 2007). We want to thank Kenneth Pomeranz for alerting us to the gender aspect of seasonal labor demand.

[8] For "industrious revolution", see Jan De Vries (2008); Akira Hayami (2015). For seasonality and sideline occupation in US, England and Japan, see Sokoloff, Kenneth L. and Dollar, David (1997); Saito, Osamu and Takashima, Masanori (2016).

profile of two regional economies of roughly half a million and 2.5 million in Hua-Lou and the Netherlands respectively. On the surface of it, both display similarly a very modern structural composition of GDP with only 31% and 25% in the primary sector respectively for the two regions.

However, the detailed data on sectoral productivities reveal sharp differences in the nature of the two economies. In the Netherlands, labor productivity in the secondary sector was about equal that of total economy and about 1.4 times of that of the primary or agricultural sector. This is quite typical of a modernizing economy where industry productivity was leading the national economy. The story was exactly the reverse for the Hua-Lou economy during the same period, where labor productivity in the primary or agriculture sector was actually about 1.14 times of the national average whereas labor productivity in the secondary sector was only 0.59 times of the national average (Li and van Zanden 2012, Tables 1 and 2). A closer examination based on cross-national productivity comparison is even more revealing. As Li and van Zanden show, while their labor productivities in the primary sectors are roughly comparable in purchasing power parity terms, Dutch labor productivity in the textile and cloth process was a striking 6.5 times of that of the Hua-Lou region. This contrast is reflective of the fact that the Dutch textile industry is largely composed of modern capital-intensive factories employing mostly full time male-laborers whereas the Hua-Lou textile production is mostly household production conducted by female laborers. Such differences carry into the comparison of patterns of urbanization as well (Li and van Zanden 2012).

## 5. Industrialization and the Path Out of "Involution"

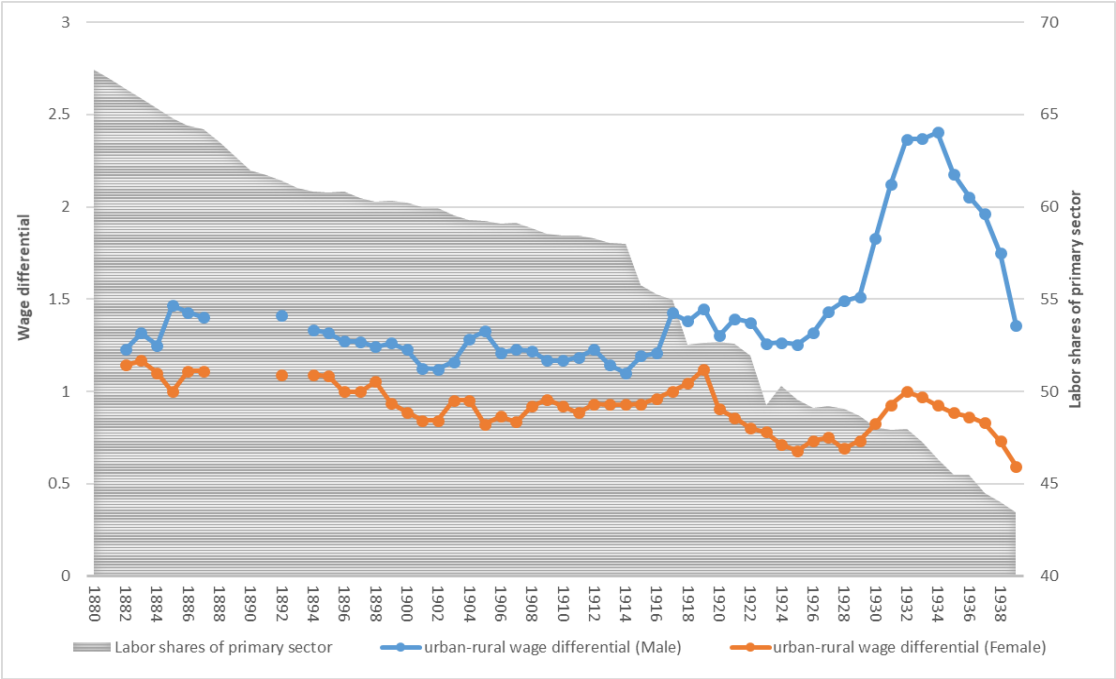
In this section, we examine how seasonality impacts the path of industrialization, urbanization and structural change. As you can see in figure 9, given seasonality in the rural area, to induce rural workers to migrate to the urban industrial sector would not only require urban wages to be higher than $MR_2$', but also total annual income in the urban sector higher than total annual rural income which would include both agricultural production and farm by-employment. Assuming workdays are equal in the urban and rural areas, urban wages would need to be at least equal to $(MR_1'l_a+MR_2'l_b)/(l_a+l_b)$ in Figure 10 ($l_a$, is labor time devoted to

mainline agricultural activity and $l_b$ is for subsidiary production). This implies that in the early phase of industrialization when urban or industrial wages were not sufficiently high, rural industries or employment would continue to thrive to take advantage of the high total annual income throughout the seasons. Urban-rural migration would only take place when industrialization gathers enough pace. This is precisely what the works of Osamu Saito and his co-author have captured for Japan that has similar agricultural environment but much more rapid industrialization in the 19-20$^{th}$ century.

Using regional data, Saito and Settsu (2010) shows that the evolution of rural by-employment took place in two stages—an expansion in the early stage, followed by a contraction. The first phase saw an expansion of industrial by-employment mainly taking place in the countryside without any contraction of the farm household sector. Indeed, correcting for rural industrial employment, differentials in average labour productivity between primary and secondary industry were not as wide as both Gerschenkronian and dual structure arguments assumed. In the early stages of Japan's industrialization, the overall level of average labour productivity in the secondary sector was more or less comparable to that in the primary sector, which interestingly echoed the earlier Li and van Zanden comparative study on sectoral productivities for early 19$^{th}$ century Lower Yangzi and Dutch regional economies. Indeed, the entire manufacturing sector in the Meiji period was not overwhelmed by the imported modes of capital-intensive and labour-saving production methods. They widened only slowly as industrialisation proceeded and became much more prominent in the period before World War I, and truly gathered pace in the inter-war period.

We can capture the inverted U narrative most vividly in Figure 11. As you can see, despite industrialization, labor share in the agriculture sector did not show marked decline until about WWI at which time, urban-rural or manufacturing-agriculture wage differential for male workers began to widen. WWI is precisely the era of high tide of dualistic development that saw the maturing of large-scale capital intensive and high productivity industries. It is interesting to note that female wage differential between urban and rural did not rise around the same period. This shows precisely female workers were largely crowded into the labor-intensive and low-skilled sector.

**Figure 11. Urban rural wage differential and primary sector labor shares in Japan**




Source:

1). Labor shares, Fukao, Kyoji, Tatsuji Makino and Tokihiko Settsu (2019);

2). Urban wages are as follows: Male and Female wages for 1882-1898 are columns (1) and (2) in Table 25 on p. 243 of Ohkawa et al, LTES, vol. 8. Male and Female wages for 1899-1939 are from Table A-7 (for All Industries) on p. 306 of Minami Ryoshin (1973). These wages are originally annual wages which we convert to daily wages by dividing them by 326 days/year. The 326 working days are based on information from after 1922 according to Table A-8 in Ryoshin (1973).

3). Rural wages for 1880-1936 are agriculture day laborers from Ohkawa et al, LTES, vol. 8, p.245.

In the much longer and winding path of Chinese industrialization, rural by-employment sustained even longer. Labor re-allocation across seasonal cycles, coupled with a very active labor market particularly for short-term hire promoted commercialization and industrialization. Indeed, given the relatively high labor return during agricultural harvest season, incentives to migrate to urban center for full-time non-agricultural work maybe dampened (See Xiao, 1958, Peng Nansheng 2007，pp. 290-301). Indeed, as revealed in the 1920s survey, migrant workers in the Shanghai cotton spinning factories largely originated from the more distant but more impoverished Northern Jiangsu province rather than from the relatively well-developed neighboring Lower Yangzi area (T'ao 1928. 359-362). The importance of seasonality to rural industry or by-employment found strongest testimonial by Chinese scholars of the 1930s

economy such as Fang Xianting: “for a nation like China where agriculture and handicraft were predominant, small-scale rural industry is actually most suitable as it takes advantage of idle labor during agricultural slack season. And this is because of the high seasonality of Chinese agriculture” (Fang Xianting 2014-16, p. 519).

The impact even carried into the Communist period. One revealing “natural experiment” of the importance of sideline activity can be seen in the case the *Kaixian Gong* Village 开弦弓村, known as Jiang Village, of the Lower Yangzi area known once for its highly developed sericultural and silk production. In 1956, in an attempt to modernize, radical governmental policies largely eliminated its sideline production and shifted labor and land to grain production. With massive investment in irrigation and fertilizer along with enhanced multi-cropping, land productivity and total agriculture output increased by nearly 60% in 1956 compared with 1936. However, it turned out this just barely made up for the value of sideline production that had been sacrificed in the process. The value of side production which had once occupied a share of 45% in 1936, were reduced to only 20% despite the much higher price of agricultural sideline goods in 1956 (See Fei Xiaotong 2001, pp. 258-269).

What this Communist era “natural experiment” reveals is the resilience of traditional Chinese rural household production to deal with the seasonality problem. Overlooking or grossly misunderstanding this important mechanism in the Chinese agricultural-industrial eco-system has led to disastrous outcome in the Communist era collectivization movement. Indeed, the revival of rural based industrialization such as township and village enterprise provided the engine of Chinese economic growth during the reform era of the 1980s and 1990s.

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