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CHINA'S ECONOMIC GROWTH, STRUCTURAL CHANGE AND THE LEWISIAN TURNING POINT*

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Abstract

Constructing an open economy Lewisian growth model with three sectors, we analyze the relationship between economic growth and the level of absolute prices. We show that the absolute price level will not increase until the economy reaches the Lewisian turning point. In addition, we show that in an economy like China, where there are strong barriers to the movement of labor to the manufacturing sector and where the ratio of net exports of goods and services to GDP is high, the economy will not reach the turning point until GDP per worker reaches a relatively high level.

Key Words: China, Lewisian turning point, Labor market, Purchasing power parity, Equilibrium exchange rate

JEL classifications: F31, F41. F42, F43, J20, J30, J43, J61, O11, O14, O41, O53

I. *Introduction*

In a country like China, which maintains strict controls on foreign exchange and frequently intervenes in the currency market, it is not surprising that the local currency is persistently undervalued in nominal terms. Normally, one would expect such a policy of deliberate currency

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undervaluation to result in a sharp rise in domestic prices, with abnormally low prices reversed not through an appreciation of the nominal exchange rate but through a rise in domestic prices. Why is this not occurring in China? A possible explanation is that, due to certain structural reasons, the equilibrium real exchange rate for China is considerably lower than that of other developing countries.

Taking this hypothesis as our point of departure, we examine how undervalued the Chinese renminbi (RMB) is in terms of purchasing power parity (PPP) by comparing China's experience with other developing countries and the development process of developed countries in the past. In addition, we construct an open economy growth model with three sectors, where - similar to the Lewis growth model - there is surplus labor in the primary sector. Using this model, we analyze the relationship between the economic growth process and the level of absolute prices (real exchange rate). We show that the absolute price level will not increase until the economy reaches the Lewisian turning point. In addition, we show that the threshold level of economic development (GDP per worker) of the Lewisian turning point depends on the characteristics of the economy such as the ratio of net exports of goods and services to GDP and barriers to the movement of labor to the manufacturing sector.

We also empirically investigate the characteristics of China's recent economic development in relation to aspects that affect the Lewisian turning point, including export-dependent economic growth, impediments to the movement of labor, and the expansion of capital-intensive industries. We then show that many of the characteristics of China's economic development have likely delayed the economy from reaching the Lewisian turning point.

The structure of this paper is as follows. In the next section, we examine how the price level in PPP terms in China has changed over time and compare this with the price level in PPP terms in Japan and South Korea during the course of their economic development. In Section III, we examine how economic development affects the industrial structure and the domestic absolute price level, using our three-sector economic growth model. In Section IV, we then consider the validity of our theoretical analysis using Chinese data. Finally, Section V summarizes the results of our analysis.

II. *Economic Development and Real Exchange Rates: An Analysis Using Purchasing Power Parity*

In this section we quickly review preceding works on the undervaluation of the RMB and show how the price level in China in PPP terms has changed over time. We also compare the trend in China's PPP-adjusted price level with Japan's and South Korea's during the course of their economic development.

1. Three Approaches to Determining whether Currencies are Undervalued

In the literature on currency under- or overvaluation, three major approaches can be identified. The first approach is to calculate the equilibrium exchange rate in the following way. First, the ratio of the long-term full-employment equilibrium current account balance to GDP is estimated based on trends in the saving-investment balance and the development stage of the economy. Next, export and import functions for goods and services are estimated. Then the change in the real exchange rate that is required to make the current account balance under full employment both at home and abroad equal the equilibrium current account balance is estimated. For example, suppose that the ratio of the equilibrium current account surplus to GDP is estimated to be 3%, and the actual current account surplus is zero under full employment both at home and abroad. Also assume that a 10% change in the real exchange rate will reduce the ratio of the surplus of the balance of goods and services to GDP by 1%. Then, the real exchange rate needs to fall by 30%. Studies employing this approach include those in the volume edited by Williamson (1994), which show several ways to calculate the equilibrium exchange rate and emphasize the usefulness of this macroeconomic equilibrium approach. Meanwhile, Edwards (2005) and Hagiwara (2008) use this approach to examine the role of real and nominal exchange rates in the process of adjusting current account imbalances. Finally, studies applying this type of approach to the Chinese economy include Goldstein (2004) and Bosworth (2004), who find that the RMB was undervalued in the early 2000s.[1]

The second approach is to calculate the equilibrium exchange rate based on information on differences in price levels at home and abroad (purchasing power parity). For example, if we convert the price of the basket of final goods and services that constitute gross domestic expenditure in China into dollars using market exchange rates and find that this price is much lower than in other countries, the RMB can be said to be undervalued.

If this approach is adopted, we need to take into account that the prices of non-traded goods are lower in less-developed countries than in developed countries. Known as the Balassa-Samuelson effect, if this effect is ignored, the equilibrium exchange rates of less-developed countries will be underestimated.[2] An accurate analysis employing this approach requires understanding how economic development changes equilibrium exchange rates.

The third approach is to compare production costs in the manufacturing sector at home and abroad. Using the export and import price (unit value) of each commodity, information on factor prices, and international input-output tables, Sato et al. (2010) estimated the equilibrium exchange rate of the RMB vis-à-vis the U.S. dollar. They found that the equilibrium exchange rate appreciated sharply from 2005 to 2008 and that consequently the RMB has been substantially undervalued. Specifically, their results suggest that the RMB should be revalued by 65% from the year 2000 level. They also provide an extensive survey of preceding studies on the undervaluation of the RMB.

Each of the three approaches has its advantages and disadvantages. For example, the first approach is useful for examining exchange rate trends over a limited period of a few years when economic conditions remain more or less unchanged. However, for a country such as China, whose economy is growing at a rate of almost 10% per year and whose industrial structure and labor market are changing rapidly as a result, this approach is not suitable, since it is based on the assumption of existing export and import functions and the underlying industrial structure and labor market. Another caveat regarding the first approach is that it is difficult to determine the "equilibrium" saving-investment balance for dynamically developing economies such as China, where both the gross saving-GDP ratio and the gross investment-GDP ratio are close to 50%.

[1] Bosworth (2004) also argued that China's strict regulations on international capital inflows and rapid accumulation of foreign currency reserves indicate that the RMB was undervalued.

[2] For details, see Balassa (1964) and Samuelson (1964, 1994).

Turning to the second approach, there are several studies that have tested whether the price level of a certain country is an outlier from the Balassa-Samuelson relationship, using either cross-country or pooled cross-country time series data. However, because the standard error in many estimations is relatively large, few studies have obtained statistically significant results. For example, testing whether China's price level is an outlier, Bosworth (2004) and Cheung et al. (2010) both found that China's price level was lower than the level predicted by Balassa-Samuelson type models, but the difference was not statistically significant.

The third approach is based on information on unit prices of traded manufactured goods and the assumption that international arbitrage holds in the long run for manufacturing products. However, as preceding studies on vertical intra-industry trade have shown (see, e.g., Fukao et al. 2003), the unit prices of developed-country exports tend to be higher than those of developing-country exports for the same commodity even when using a very disaggregated commodity classification. It therefore appears that developing countries tend to specialize in the production of cheaper products of lower quality relative to the products of developed countries. Because of this intra-industry division of labor across countries, it is problematic to assume arbitrage between developed- and developing- country manufacturing products.

The issue that we are interested in in this paper is how China's economic development and structural changes affect the value of its currency. Therefore, we adopt the second approach and investigate whether China has been an outlier in comparison with other countries. We also compare China's experience with Japan's and South Korea's experience in their early economic development process. Since preceding studies almost unanimously find that the RMB is undervalued, we do not test statistically whether and how much the RMB is undervalued.

2. China's Price Level in International Comparison

Let us start by comparing the absolute price level of China and other countries relative to the U.S. level in terms of market exchange rates using the Penn World Table.[3] If China's price level is relatively low compared with other countries, this implies that the RMB is undervalued.

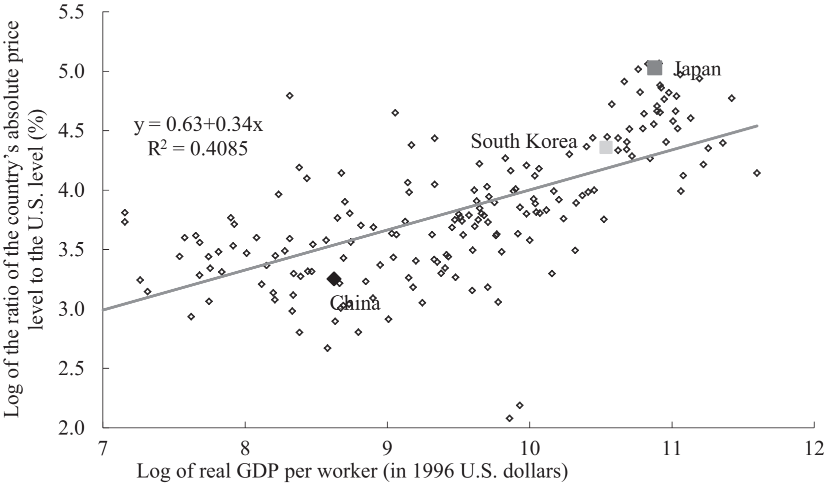
Figure 1 shows a scatter diagram of the logarithm of real GDP per worker (in 1996 U.S. dollars) on the horizontal axis and the logarithm of the ratio of each country's absolute price level relative to the U.S. level on the vertical axis for 1996. The reason for choosing 1996 is that in this year a survey of absolute price levels in a large number of countries around the world was conducted.[4] The trend line estimated using ordinary least squares (OLS) slopes upwards, which is consistent with the Balassa-Samuelson theory: the richer a country, the higher its price level relative to that in other countries when converted at market exchange rates. As can be seen in the figure, China falls below the trend line, which suggests that the RMB was undervalued in 1996.

Figure 1 suggests that the RMB was undervalued in the late 1990s. Yet, since 1996,

[3] Specifically, taking China as an example, we calculate the following: China's absolute price level for final domestic expenditure (in RMB) / RMB-USD market exchange rate (RMB-denominated) × U.S. absolute price level for final domestic expenditure (in USD).

[4] The latest benchmark year of the International Comparison Project, a World Bank-led survey of absolute price levels in countries around the world, is 2005. China's absolute price level in the 2005 survey was much higher than that in Figure 1. However, China's 2005 survey does not fully reflect low prices in rural areas and likely overestimates China's price level (see World Bank 2007). We therefore do not use the 2005 but the 1996 survey results here.

FIG. 1. LOG OF REAL GDP PER WORKER (IN 1996 U.S. DOLLARS) AND LOG OF THE RATIO OF THE ABSOLUTE PRICE LEVEL TO THE U.S. LEVEL (%) OF EACH COUNTRY IN 1996



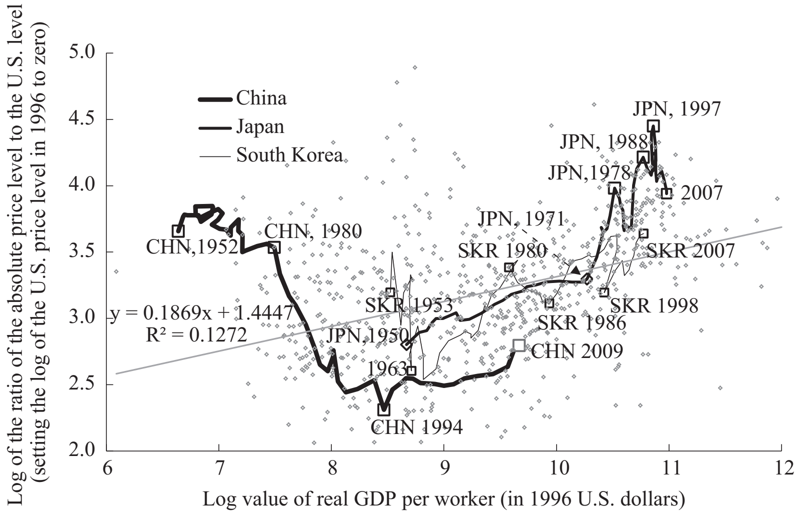
Source: Penn World Table (PWT) 6.3.

China's GDP per worker has increased sharply. Let us therefore examine how the relationship shown in Figure 1 changed over time and compare the results for China with those for Japan and South Korea. To do so, however, we cannot simply take Figure 1 and plot the values for each country for years before and after 1996. The reason is that, according to the Balassa-Samuelson theorem, countries' price level relative to that of the United States will be affected not only by increases in their real GDP per worker, but also by increases in U.S. real GDP per worker. Therefore, in order to examine how countries' own economic development affects their price level relative to that of the United States we need to strip out the effect of rises in prices in the United States associated with U.S. economic growth from the vertical axis.

We do so in Figure 2, where values on the vertical axis are calculated using the following formula: log of the country's price level relative to the U.S. level in year t + slope of the trend line in Figure 1 × (log of real GDP per worker in the U.S. in 1996 (in 1996 U.S. dollars) — log of real GDP per worker in the U.S. in year t (in 1996 U.S. dollars)). In other words, the vertical axis in Figure 2 shows each country's absolute price level (converted using the market exchange rate) in year t relative to the price level in the United States in 1996. The development over time in the relative price levels of China, Japan, and South Korea are shown in Figure 2 by connecting the values for the different years. The straight line in the graph depicts the trend line obtained using OLS.

Figure 2 shows that domestic prices in Japan and South Korea, when converted using market exchange rates, became relatively high following the collapse of their dollar peg in the early 1970s (that is, the yen and the won became overvalued). On the other hand, for China, the values have been below the trend line since the RMB was substantially devalued in the mid-1980s (i.e., the RMB has been undervalued since then). Moreover, between the mid-1980s

FIG. 2. CHANGES IN THE LOG OF REAL GDP PER WORKER (IN) 1996 U.S. DOLLARS) AND THE LOG OF THE ABSOLUTE PRICE LEVEL CONVERTED AT MARKET EXCHANGE RATES (SETTING THE LOG OF THE U.S. PRICE LEVEL IN 1996 TO ZERO): 1950-2007



Note: See text for an explanation of the way the values on the vertical axis were calculated. The data for China are for 1952-2009.

Source: Penn World Table (PWT) 6.3.

and the mid-1990s, the vertical gap between the values for China and the trend line continued to expand, although since then it has remained more or less unchanged.

China's and South Korea's absolute price levels converted using market exchange rates were very high (i.e., their currencies were overvalued) until the mid-1980s and the early 1960s, respectively. We conjecture that the reason for the high price levels in both countries in the early stages of development is that their exchange rates were set artificially high, but strict controls on foreign exchange and trade prevented the domestic price level from being pushed down through the import of cheaper foreign goods.

With the exception of these early years, however, the absolute price level has been low in China up to the present, while it was low in South Korea until the early 1970s. Figure 2 also shows that Japan's absolute price level converted using market exchange rates was low in the 1950s, rose gradually. and came close to the trend line in the 1960s. It initially remained relatively stable following the Nixon Shock in 1971, but then started to rise in the wake of runaway inflation following the first oil shock and, subsequently, the appreciation of the yen.

Note that China's GDP per worker converted to PPP in 2009 was at the same level as that of Japan in 1964 and that of South Korea in 1982. As shown in Figure 2, the absolute price level converted using exchange rates rose significantly in Japan and South Korea as their economies grew in those years, while in China prices remained low (i.e., the RMB remained undervalued).

As mentioned, China's price level has been exceptionally low (the RMB has been undervalued) since the mid-1980s. Given that China employs tight controls on foreign exchange allied with heavy market intervention, it is not surprising that the local currency has been persistently undervalued in nominal terms. However, textbook open economy macroeconomics suggests that China's policy should cause domestic prices to rise and that the situation of exceptionally low prices (currency undervaluation) should be reversed by rising domestic prices, given that the nominal exchange rate is more or less fixed.

In fact, inflation has indeed become a serious problem in China in recent years, but the extent of this inflation is still too low to offset the undervaluation of the RMB. A possible explanation could be that the equilibrium exchange rate for China remains significantly below the rate suggested by PPP for some sort of structural reasons. If this is the case, the RMB could appreciate sharply if those structural reasons are removed. Based on these considerations, we construct and open economy macroeconomic model in the next section to examine the relationship between economic development and the ratio of the level of domestic prices converted using market exchange rates to the overseas price level. In the model, we consider surplus labor in the agricultural sector, factors impeding the inter-sectoral movement of labor, limitations on the amount of land and natural resources per worker, and the effects of technological progress, which differs across sectors, and capital accumulation.

III. *Economic Growth, the Lewisian Turning Point, and the Equilibrium Exchange Rate: An Analysis Using a Three-Sector Open Economy Model*

1. Theoretical Model

Assume a small, open economy. The economy consists of three sectors: a primary sector, manufacturing, and services, respectively producing primary products, manufacturing products, and services. In addition, assume that production in these sectors is determined by Cobb-Douglas production functions. The factor inputs in the primary sector (A) are natural endowments (L), including land, and labor (N_A). The factor input in the service sector (S) is assumed to be labor (N_S) only. The factor inputs in the manufacturing sector (M) are assumed to be capital (K) and labor (N_M). The production functions for the three sectors thus are given by

$$Q_A = \Omega_A L^{\alpha} N_A^{\,1-\alpha}$$
$$Q_S = \Omega_S N_S$$
$$Q_M = \Omega_M K^{\beta} N_M^{\,1-\beta}$$

In the equations above, Ω_A, Ω_S, and Ω_M represent total factor productivity (TFP) in each sector. For the sake of simplicity, let us assume that Ω_A and Ω_S do not change over time, but Ω_M increases. Further, we assume that L is constant over time and K is given in the short run. The markets for all outputs and production factors are assumed to be perfectly competitive.

Of the three product categories, primary and manufacturing products are assumed to be traded goods, and the same goods are produced both at home and abroad. We assume that the home country is relatively small and the relative price of primary products in terms of manufacturing products, P_A, is determined in the world market and the country is a price taker. We use manufacturing products of this country as the numeraire and set the price level equal to one. While the country can affect domestic prices by introducing tariffs and subsidies so that they differ from international prices, we will leave examining the impact of foreign trade policies on equilibrium real exchange rates until later.

Next, given that the marginal product of labor in the service sector is assumed to be constant, we can express the output price of the service sector, P_S, by w/Ω_S, where w is the wage rate in terms of manufacturing products as the numeraire and Ω_S is TFP.

The expenditure shares of primary products, manufacturing products, and service products, γ_A, γ_M, and γ_S, are constant and identical across domestic consumption, private investment, and government expenditure. Under these assumptions, the price index for domestic expenditure can be defined as

$$P = P_A^{\gamma_A} P_S^{\gamma_S} = P_A^{\gamma_A}\left(\frac{w}{\Omega_S}\right)^{\gamma_S}$$

As we will discuss later, a country grows rich as it accumulates capital (K) and manufacturing sector TFP (Ω_M). In an economy like China's, at a relatively early stage of economic development, there is likely to be surplus labor in the primary sector, providing sufficient cheap labor for the manufacturing sector. Following Lewis (1954, 1958, 1979), we model this situation by assuming that because of the existence of surplus labor in the primary sector, the marginal product of labor in this sector is below the subsistence level, and the wage rate is set at the minimum subsistence level, ω,[5] which is higher than the marginal product of labor in the primary sector.

With the real wage rate given by w/P, a Lewis-type situation can be expressed as follows: If

$$\frac{P_A \Omega_A (1-\alpha)\left(\frac{L}{N_A}\right)^{\alpha}}{P} < \omega \tag{1}$$

then

$$\frac{w}{P} = \omega \tag{2}$$

When workers move from the primary sector to the manufacturing sector as the economy develops, they need to cope with higher living costs and the risk of unemployment in the modern sector. In a country like China, where, because of the family registration system, unskilled workers from rural areas face various forms of disadvantages, such as discriminatory treatment in education for their children, the costs of moving from the primary sector to the manufacturing sector are likely to be particularly high.

To take this aspect into consideration, let us assume that the wage rate in the manufacturing sector needs to be $(1+\delta)$ times as high as that in the primary sector for workers to work in the manufacturing sector. Further, with regard to the service sector, two alternative assumptions are possible: we could either assume that workers are farmers that are engaged in by-employments or work in small towns where they can find sufficient work to make ends

[5] With regard to whether China's agricultural sector is characterized by surplus labor, refer to Athukorala et al. (2009) and Minami and Ma (2009, 2010).

meet; or we could assume that people engaged in the service sector work in large cities, where they face the same high costs as workers in the manufacturing sector. In the analysis below, we make the former assumption, which implies that workers move between the primary sector and service sector at the same wage rate. However, even if we were to assume that workers in the service sector need $(1+\delta)$ times the wage rate in the primary sector, the results below remain essentially unchanged. Thus, in the analysis that follows, it is assumed that as a result of the inter-sectoral movement of labor, the wage rates in the primary, service, and manufacturing sectors are w, w, and $(1+\delta)\,w$, respectively.

Next, let us consider the conditions for market equilibrium. First, we examine a situation in which, because of a relatively high wage rate in the primary sector, not condition (1), but the following condition pertains:

$$\frac{P_A \Omega_A (1-\alpha)\left(\dfrac{L}{N_A}\right)^{\alpha}}{P} \geq \omega \tag{3}$$

In this case, the marginal product of labor is equal to the wage rate in all three sectors through cost minimization by producers, and the wage rates in the three sectors need to satisfy the following equality:

$$P_A \Omega_A (1+\delta)(1-\alpha)\left(\frac{L}{N_A}\right)^{\alpha} = (1+\delta)w = \Omega_M (1-\beta)\left(\frac{K}{N_M}\right)^{\beta} \tag{4}$$

The GDP of the country using manufacturing products as the numeraire can be expressed as follows:

$$Y = P_A \Omega_A L^{\alpha} N_A^{\ 1-\alpha} + wN_S + \Omega_M K^{\beta} N_M^{\ 1-\beta}$$

In China, domestic saving far exceeds domestic investment and the country is recording huge net exports of goods and services. To model this situation, we express the ratio of domestic absorption to GDP by $1-\eta$, where η is net exports of goods and services divided by GDP. Some developing countries export a great deal of services, including tourism. For the sake of simplicity, however, we assume that services are non-tradable and that if η increases, demand for domestic services declines. Nominal demand for services is expressed as $\gamma_S(1-\eta)$ Y.

For goods market equilibrium, the following equality needs to hold:

$$\gamma_S(1-\eta) = \frac{wN_S}{P_A \Omega_A L^{\alpha} N_A^{\ 1-\alpha} + wN_S + \Omega_M K^{\beta} N_M^{\ 1-\beta}} \tag{5}$$

Lastly, the condition for labor market equilibrium is as follows:

$$N_A + N_S + N_M = N \tag{6}$$

We assume that the quantity of labor in the entire economy, N, is given in the short run.

In a non-Lewisian situation, where condition (3) holds, labor input in each sector, N_A, N_S, and N_M, and the wage rate w are determined by equilibrium conditions (4), (5), and (6), where K (capital), Ω_M (manufacturing sector TFP), and N (workforce in the entire economy) are given in the short run.

If the economy is in a Lewisian situation, where condition (1) holds, the wage rate is determined as follows:

$$\frac{w}{P_A^{\gamma_S}\left(\frac{w}{\Omega_S}\right)^{\gamma_S}}=\omega \tag{7}$$

Labor input in the three sectors is determined by the following three equations:

$$(1+\delta)w=\Omega_M(1-\beta)\left(\frac{K}{N_M}\right)^{\beta} \tag{8}$$

$$\gamma_S(1-\eta)=\frac{wN_S}{P_A\Omega_A L^{\alpha}N_A{}^{1-\alpha}+wN_S+\Omega_M K^{\beta}N_M{}^{1-\beta}} \tag{9}$$

$$N_A+N_S+N_M=N \tag{10}$$

In both sets of equilibrium conditions (the non-Lewisian case and the Lewisian case), there is no guarantee that domestic supply in the primary and manufacturing sectors is equal to domestic demand. The difference is adjusted through exports and imports.

Finally, real GDP per worker is determined by the following equation, regardless of whether the economy is in a Lewisian situation or not:

$$y=\frac{Y}{NP}=\frac{Y}{NP_A{}^{\gamma_A}\left(\frac{w}{\Omega_S}\right)^{\gamma_S}} \tag{11}$$

This concludes our description of the equilibrium conditions.

2. Determinants of the Price Level

Next, we examine how the price level (P) changes when real GDP per worker (y) rises with economic growth, and how this relationship between P and y is affected by the ratio of domestic absorption to GDP ($1-\eta$), the extent of barriers to the movement of labor to the manufacturing sector (δ), the level of capital in the manufacturing sector (K), the TFP level in each sector (Ω_A, Ω_S, Ω_M), and the amount of land per worker (L/N). To do so, we solve our equilibrium conditions and the derive the short-run equilibrium levels of labor input in each sector, wage rates, real GDP per worker, and price levels. As already mentioned, we assume that K, Ω_A, Ω_S, Ω_M, and N are given in the short run.

Let us begin by looking at the non-Lewisian situation.

We express the sectoral distribution of labor using the ratio of the number of workers in each sector to the number of workers in the entire economy, $n_A=N_A/N$, $n_S=N_S/N$, and $n_M=N_M/N$. Using the cost minimization condition (4), we obtain the following equation:

$$n_A=\left(\frac{P_A\Omega_A(1+\delta)(1-\alpha)}{\Omega_M(1-\beta)}\right)^{\frac{1}{\alpha}}\left(\frac{K}{N}\right)^{-\frac{\beta}{\alpha}}\left(\frac{L}{N}\right)n_M{}^{\frac{\beta}{\alpha}} \tag{12}$$

The goods market equilibrium condition (5) and the cost minimization condition (4) yield

$$\gamma_S(1-\eta)=\frac{n_S}{\frac{1}{1-\alpha}wn_A+wn_S+\frac{1+\delta}{1-\beta}wn_M} \tag{13}$$

From the labor market equilibrium condition (10) and from (12) and (13), we can derive the following two equations:

$$\begin{aligned}&\left(1+\frac{\alpha}{1-\alpha}\gamma_S(1-\eta)\right)\left(\frac{P_A\Omega_A(1+\delta)(1+\alpha)}{\Omega_M(1-\beta)}\right)^{\frac{1}{\alpha}}\left(\frac{K}{N}\right)^{-\frac{\beta}{\alpha}}\left(\frac{L}{N}\right)n_M{}^{\frac{\beta}{\alpha}}\\&\quad+\left(1+\frac{\beta+\delta}{1-\beta}\gamma_S(1-\eta)\right)n_M=1-\gamma_S(1-\eta)\end{aligned} \tag{14}$$

$$\begin{aligned}&\left(1+\frac{\alpha}{1-\alpha}\gamma_S(1-\eta)\right)n_A\\&+\left(1+\frac{\beta+\delta}{1-\beta}\gamma_S(1-\eta)\right)\left(\frac{\Omega_M(1-\beta)}{P_A\Omega_A(1+\delta)(1-\alpha)}\right)^{\frac{1}{\beta}}\left(\frac{L}{N}\right)^{-\frac{\alpha}{\beta}}\left(\frac{K}{N}\right)n_A{}^{\frac{\alpha}{\beta}}=1-\gamma_S(1-\eta)\end{aligned} \tag{15}$$

The two equations above can be regarded as the implicit functions of n_A and n_M, where structural parameters determine n_A and n_M. They show that changes in variables that reduce the marginal product of labor in the primary sector relative to that in the manufacturing sector, such as a rise in K/N, a decline in L/K, an increase in Ω_M, a fall in Ω_A, and a decrease in P_A, will reduce n_A and increase n_M. A decline in barriers to the movement of labor to the manufacturing sector (δ) will also lower n_A and raise n_M. On the other hand, a rise in the ratio of net exports of goods and services to GDP, η, will lead to an increase in the traded goods sectors and raise both n_A and n_M.

From conditions (6) and (13), we obtain the following equation regarding employment in the service sector:

$$n_S=\frac{\frac{\delta}{1-\beta}\gamma_S(1-\eta)}{1+\frac{\beta+\delta}{1-\beta}\gamma_S(1-\eta)}+\frac{\left(\frac{1}{1-\alpha}-\frac{1+\delta}{1-\beta}\right)\gamma_S(1-\eta)}{1+\frac{\beta+\delta}{1-\beta}\gamma_S(1-\eta)}n_A \tag{16}$$

Whether service sector employment increases as a result of the accumulation of capital, K, and the increase in manufacturing sector TFP, Ω_M, as a result of the industrialization process bringing about the movement of labor from the primary sector to the manufacturing sector depends on the relative size of $1/(1-\alpha)$ and $(1+\delta)/(1-\beta)$ in the second term on the right side of equation (16).

The following thought experiment provides an intuitive explanation why this is the case. Suppose that there is a simultaneous increase in K/N and decrease in L/N. As we will show later, an increase in K/N will raise the wage rate, while a decrease in L/N will reduce the wage rate. For the time being, however, we assume that the two effects cancel each other out and the wage rate remains unchanged. Both the increase in K/N and the decrease in L/N will reduce n_A. Denoting this reduction in n_A by Δn, total output in the primary sector will decrease by $w\Delta n\,/\,(1-\alpha)$. If all the labor denoted by Δn moves to the manufacturing sector, the total output of the manufacturing sector increases by $(1+\delta)\,/\,(1-\beta)\,\Delta n$. Further, suppose that $1\,/\,(1-\alpha)<$

$(1+\delta)$ / $(1-\beta)$ holds, then the total output of traded goods (primary goods plus manufacturing products) will increase. This means that because the ratio of service output to the total output of traded goods, $\gamma_S(1-\eta)$ / $(1-\gamma_S(1-\eta))$, is assumed to be constant, service output must increase. But if all the workers represented by Δn move to the manufacturing sector, service output cannot increase, which is a contradiction. This means that if 1 / $(1-\alpha)<(1+\delta)$ / $(1-\beta)$ is to hold, the decrease in labor input in the primary sector must be accompanied by an increase in labor input in the service sector.

This thought experiment explains why the relative sizes of $1/(1-\alpha)$ and $(1+\delta)$ / $(1-\beta)$ play a role, but the mechanism it describes is unlikely to be important for understanding economic development. Moreover, it is difficult to empirically evaluate which is larger, 1 / $(1-\alpha)$ or $(1+\delta)$ / $(1-\beta)$. For these reasons and for the sake of simplicity, we conduct our analysis around the point where 1 / $(1-\alpha)=(1+\delta)$ / $(1-\beta)$ holds. In other words, we assume a situation where n_S is not affected by a decline in n_A in the process of industrialization.

By fully differentiating equation (16) around the point where 1 / $(1-\alpha)=(1+\delta)$ / $(1-\beta)$ holds, we can examine the effect of changes in given parameters and endowments on n_S. Doing so, we find the following:

- a rise in the ratio of net exports of goods and services to GDP, η, leads to an increase in the traded goods sector and reduces labor input in the service sector, n_S;
- a rise in barriers to the movement of labor to the manufacturing sector, δ, boosts labor input in the service sector, n_S: and
- changes in K/N, L/K, Ω_M, Ω_A, and P_A do not change labor input in the service sector, n_S.

Based on these findings, we express n_S as a function of η and δ:

$$n_S=n_S(\eta,\ \delta) \tag{17}$$

Next, let us see how the wage rate changes with economic development. We can define the labor demand function in the manufacturing sector from equation (4) as follows:

$$n_M=\left(\frac{\Omega_M(1-\beta)}{1+\delta}\right)^{\frac{1}{\beta}}\left(\frac{K}{N}\right)w^{-\frac{1}{\beta}} \tag{18}$$

By substituting the equation above into equation (14), we obtain the implicit function of the equilibrium wage rate:

$$\left(1+\frac{\alpha}{1-\alpha}\gamma_S(1-\eta)\right)(P_A\Omega_A(1-\alpha))^{\frac{1}{\alpha}}\left(\frac{L}{N}\right)w^{-\frac{1}{\alpha}}$$
$$+\left(1+\frac{\beta+\delta}{1-\beta}\gamma_S(1-\eta)\right)\left(\frac{(1-\beta)\Omega_M}{1+\delta}\right)^{\frac{1}{\beta}}\left(\frac{K}{N}\right)w^{-\frac{1}{\beta}}=1-\gamma_S(1-\eta) \tag{19}$$

From the equation above, we find that increases in K/N, L/K, Ω_M, Ω_A, or P_A, all boost the wage rate. In contrast, an increase in the ratio of net exports of goods and services to GDP, η, or a decline in domestic absorption, reduces the wage rate through a decline in demand for the service sector, which is the most labor-intensive sector. The effect of changes in δ on w is indeterminate. We express the relationships above in terms of the following function:

$$w=w\left(\frac{K}{N}, \frac{L}{K}, \Omega_M, \Omega_A, P_A, \eta, \delta\right) \tag{20}$$

Lastly, let us examine the relationship between GDP per worker, y, and the price level, P. From equations (9), (11), (17), and (20), we obtain

$$y=\frac{w}{\gamma_S(1-\eta)P}n_S(\eta, \delta) \tag{21}$$

From the definition of the price level, P, we obtain

$$w=\Omega_S\frac{P^{\frac{1}{\gamma_S}}}{P_A}$$

And the two equations above yield

$$y=\frac{\Omega_S}{P_A\gamma_S(1-\eta)}P^{\frac{1-\gamma_S}{\gamma_S}}n_S(\eta, \delta) \tag{22}$$

The equation above tells us that there is the following relationship between the log of GDP per worker and the log of the absolute level of prices:

$$\ln(P)=\frac{\gamma_S}{1-\gamma_S}\ln(y)-\frac{\gamma_S}{1-\gamma_S}\ln\left(\frac{\Omega_S}{P_A\gamma_S(1-\eta)}\right)-\frac{\gamma_S}{1-\gamma_S}\ln(n_S(\eta, \delta)) \tag{23}$$

Thus, taking structural parameters such as Ω_S, η, and δ, as given and assuming the economy develops driven by capital accumulation and increases in TFP in the manufacturing sector, a graph with the log of GDP per worker on the horizontal axis and the log of the absolute price level on the vertical axis would show a straight line with slope $\gamma_S / (1-\gamma_S)$. Moreover, since, as mentioned above, $n_S(\ )$ is an increasing function of δ, an increase in δ, which denotes the extent of barriers to the movement of labor to the manufacturing sector, shifts the straight line downward. As can be confirmed from equation (16) and the equation above, an increase in the ratio of net exports to GDP, η, also moves the line downward. Lastly, an increase in TFP in the service sector, Ω_S, also shifts the line downward. Thus, for a given level of PPP-adjusted GDP per capita, the absolute level prices is lower the higher δ, η, and Ω_S.

For instance, if γ_S is 0.4, the slope of the line would be 0.67, which is about twice as large as the coefficient, 0.34, of the regression based on the cross-country data shown in Figure 1. A possible explanation for this gap between our theoretical and empirical results is that through economic development, productivity in the service sector, Ω_S, rises, so that the straight line gradually shifts downward over time.

Next, let us examine the relationship between real GDP per worker and the absolute price level in a Lewisian situation. In this case, as shown in equation (7), the real wage rate, w/P, is determined by the subsistence level, ω, and stays constant over time, if ω does not change. Consequently, the wage rate, w, measured using manufacturing products as the numeraire, is given by the following equation:

$$w=\omega^{\frac{1}{1-\gamma_S}}\Omega_S^{-\frac{\gamma_S}{1-\gamma_S}}P_A^{-\frac{\gamma_A}{1-\gamma_S}} \tag{24}$$

The equation shows that the wage rate, w, will be higher the higher the subsistence level, ω, the lower productivity in the service sector, Ω_S, and the lower the international price of primary products, P_A.

As we will show later, just as in the non-Lewisian case, an increase in K/N through capital accumulation and in manufacturing sector TFP, Ω_M, in the Lewisian case will lead to an increase in labor input in the manufacturing sector. As a result of the movement of labor from the primary sector, the labor surplus in the primary sector will gradually diminish, and the economy will eventually reach the Lewisian turning point, at which all surplus labor from the primary sector has been absorbed. Real GDP per worker at this Lewisian turning point, denoted by y^*, can be defined in terms of the following equation:

$$y^* = \frac{\omega}{\gamma_S(1-\eta)} n_S(\eta, \delta) \tag{25}$$

Under our assumption that $1 / (1-\alpha)$ and $(1+\delta) / (1-\beta)$ are sufficiently close, we can see from equation (16) for nS ( ) and equation (25) that GDP per worker at the Lewisian turning point, y^*, will be lower the lower is ω, the lower are barriers to the movement of labor to the manufacturing sector, δ, and the lower is the ratio of net exports of goods and services to GDP, η. On the other hand, GDP per worker at the turning point, y^*, is not affected by factors determining growth in GDP per worker, y, that is, productivity levels Ω_A, Ω_S, and Ω_M, and factor endowments L/N and K/N.

From equation (24) and the definition of the price level, P, we obtain the following equation, which determines P in a Lewisian situation:

$$P = P_A^{\frac{\gamma_A}{1-\gamma_S}} \omega^{\frac{\gamma_S}{1-\gamma_S}} \Omega_S^{-\frac{\gamma_S}{1-\gamma_S}} \tag{26}$$

The equation shows that price level P is higher the higher is ω, the lower is productivity in the service sector, Ω_S, and the higher is the international price of primary products, P_A. If we assume that these variables remain unchanged as the economy grows, a graph with the log of GDP per worker on the horizontal axis and the log of the price level on the vertical axis would show a horizontal line in the Lewisian case with surplus labor in the primary sector.

3. Economic Growth and the Lewisian Turning Point

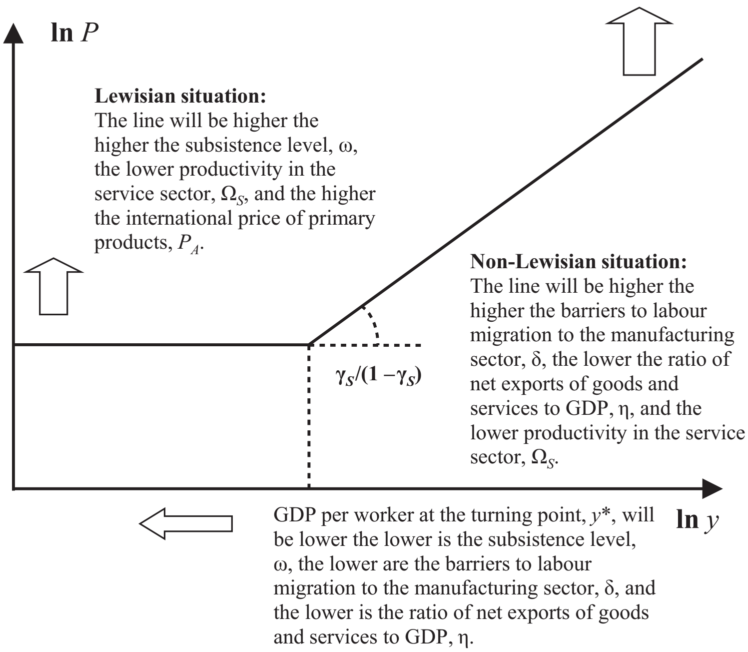
Next, we examine economic growth in a Lewisian situation in more detail.

From equations (8) and (24) we can obtain the ratio of workers in the manufacturing sector to total labor, n_M:

$$n_M = \left(\frac{(1-\beta)\Omega_M}{(1+\delta)w}\right)^{\frac{1}{\beta}} \frac{K}{N} = \frac{(1-\beta)^{\frac{1}{\beta}} \Omega_M^{\frac{1}{\beta}} \Omega_S^{\frac{\gamma_S}{\beta(1-\gamma_S)}}}{(1+\delta)^{\frac{1}{\beta}} \omega^{\frac{1}{\beta(1-\gamma_S)}} P_A^{\frac{\gamma_A}{\beta(1-\gamma_S)}}} \frac{K}{N} \tag{27}$$

The equation above suggests that an increase in K/N through capital accumulation and a rise in TFP in the manufacturing sector, Ω_M, lead to an increase in the ratio of workers working in the manufacturing sector to total labor, n_M. Moreover, it shows that a rise in TFP in the service sector, Ω_S, a decline in the price of primary products, P_A, and a decline in barriers to the movement of labor to the manufacturing sector, δ, all raise the ratio of workers in the

FIG. 3. REAL GDP PER WORKER AND THE PRICE LEVEL AROUND THE LEWISIAN TURNING POINT



manufacturing sector to total labor, n_M.

From equation (9), which shows the equilibrium condition for the goods market, we obtain

$$\frac{\gamma_S(1-\eta)}{1-\gamma_S(1-\eta)}=\frac{wn_S}{P_A\Omega_A\left(\frac{L}{N}\right)^{\alpha}(n-n_S-n_M)^{1-\alpha}+\Omega_M\left(\frac{K}{N}\right)^{\beta}n_M{}^{1-\beta}} \tag{28}$$

Equations (27) and (28) determine the ratio of workers in the service sector to total labor, n_S. The two equations imply that an increase in K/N through capital accumulation and a rise in TFP in the manufacturing sector, Ω_M, raise not only n_M but also n_S, while equation (9) means that GDP per worker also rises.

The results of our theoretical analysis of economic development both in a Lewisian situation and in a non-Lewisian situation are summarized in Figure 3, which shows the relationship between the log of real GDP per worker and the log of the price level.

Let us summarize the main results of our theoretical analysis. Our model suggests that in a Lewisian situation with surplus labor in the primary sector, where subsistence wages are above the marginal product of labor, the absolute price level will not increase relative to levels abroad in the early stages of industrialization brought about by capital accumulation and TFP increases in the manufacturing sector. This irresponsiveness of the absolute price level to economic growth will continue until all the surplus labor in the primary sector has been absorbed by the manufacturing sector and the marginal product of labor in the primary sector rises above the subsistence level, i.e., the Lewisian turning point is reached. Once the economy has reached the

Lewisian turning point, the absolute price level will increase with economic growth. The percentage increase in the absolute price level in response to a 1% increase in real GDP per worker depends on the ratio of expenditure for services to domestic expenditure, γ_S. For instance, based on our empirical result above, if γ_S is 0.4, a 1% increase in real GDP per worker will lead to a 0.67% percent rise in the absolute price level.

We also found that the absolute price level before the economy reaches the Lewisian turning point depends on certain structural factors. That is, in a Lewisian situation, the absolute price level is lower the lower the subsistence real wage rate, the higher productivity in the service sector, and the lower the international price of primary products relative to manufacturing products.

The analysis has further shown that what level the PPP-adjusted GDP per worker reaches before the economy arrives at the Lewisian turning point depends on a number of structural and policy factors. That is, the level of GDP per worker at which the turning point is reached will be higher the higher the subsistence real wage level, ω, the barriers to the movement of labor to the manufacturing sector, δ, or the ratio of net exports of goods and services to GDP, η. Put differently, these factors will delay the point in the development process at which the Lewisian turning point is reached.

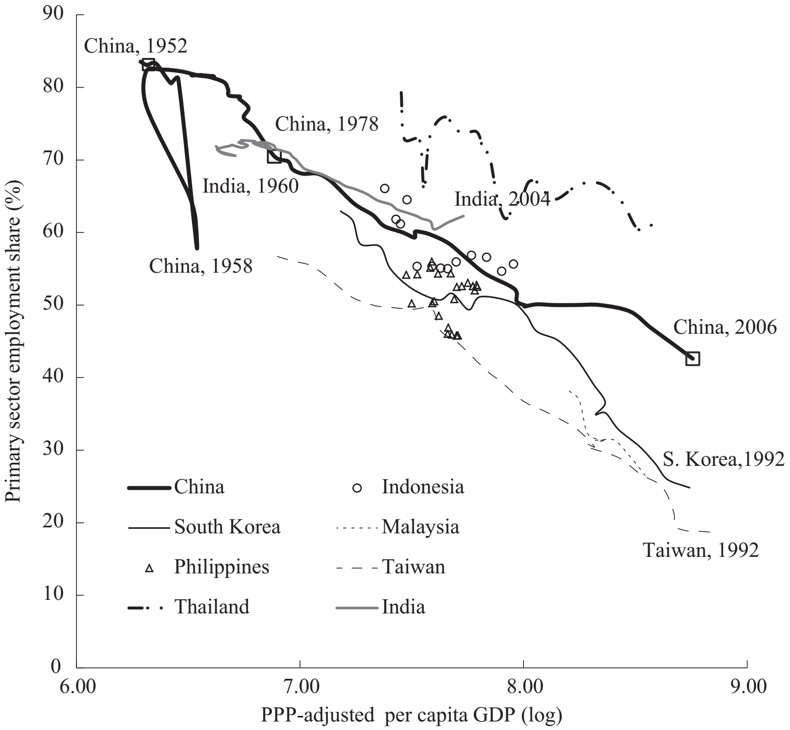
The reason that barriers to the movement of labor to the manufacturing sector affect the level of GDP per worker at which the turning point is reached is that the higher such barriers are, the higher the wage rate in the manufacturing sector needs to be, and the slower the movement of labor out of the primary sector will be. This means that even when GDP per worker in the economy as a whole continues to rise through capital accumulation and increases in manufacturing sector TFP, the marginal productivity of labor in the primary sector will remain low for a considerable time and the economy will not escape from the Lewisian situation.

Next, the reason that the ratio of net exports of goods and services to GDP, η, affects the level of GDP per worker at which the turning point is reached is as follows. In our model, which assumes that services are non-tradable, the higher is the ratio of net exports to GDP, η, the smaller is the share of the service sector in the economy overall. However, in a Lewisian situation, the real wage rate in the service sector, to which labor from the primary sector can move relatively easily, remains at the subsistence level. Thus, in a Lewisian situation, a higher ratio of net exports to GDP, η, implies a smaller share of subsistence wage service sector workers, so that GDP per worker in the economy overall (i.e., the average of wages in all three sectors of the economy plus rent for land and other natural resources in the primary sector per all the workers in the economy plus returns to capital stock in the manufacturing sector per all the workers in the economy) will be higher when the Lewisian turning point is reached. Put differently, an economy where development is led by exports will reach the turning point at a later stage (at a higher per capita GDP) than an economy where this is not the case.

IV. *Factors Delaying China from Reaching the Lewisian Turning Point*

In this section we consider whether China has reached the Lewisian turning point and, if not, what is delaying China from reaching the turning point, based on the theoretical model discussed in the previous section and actual data.

Fig. 4. PPP-Adjusted GDP per Capita and Primary Sector Employment in Selected Asian Countries



Sources: The Conference Board and Groningen Growth and Development Centre, *Total Economy Database* (http: //www.conference-board.org/data/economydatabase/); World Bank, *World Development Indicators* (http: //data.worldbank.org/indicator).

1. Has China Reached the Turning Point?

We start by examining whether China has reached the Lewisian turning point or not. To do so, in Figure 4 we look at how the labor input share in the primary sector in East Asian countries, including China, has declined as their economies have developed. The level of economic development is measured in terms of GDP per capita on a PPP basis. The figure shows that, at around 40%, the share of workers in the primary sector still remains quite high in China. While that share is lower than the equivalent share in Thailand, which has plenty of arable land, it is far higher than that in South Korea, Taiwan, or Malaysia when they were at similar levels of GDP per capita.

As our theoretical model in the previous section has shown, it is not straightforward to say to what level the employment share of the primary sector needs to fall before a country reaches the Lewisian turning point, since that level depends on a number of factors such as the availability of arable land. However, what we can say with certainty is that the share of primary sector employment is still relatively high in China.[6]

The main focus of most studies on China and the Lewisian turning point has not been the primary sector employment share, though, but trends in wage rates. Although there has been substantial migration of agricultural workers to urban areas, this has been combined with labor shortages, giving rise to the seemingly contradictory co-existence of a shortage of migrant workers and surplus labor in rural areas. Against this background, wage rates have been rising sharply since 2000, especially in coastal areas. Given these developments, a considerable number of researchers are now arguing that China has reached the Lewisian turning point (see, e.g., Cai (2005, 2007a, 2007b), Garnaut and Huang (2006), Hausman et al. (2006), Siebert (2007), Islam and Yokoda (2008), and Wu (2007)).

There are a number of studies critical of this argument. For example, Lu and Cui (2010), pointing out that the employment share of agricultural in China is still high and there are institutional barriers to the movement of labor from agricultural, suggest that China still has ample surplus labor in its agricultural sector. They further argue that China's economy is characterized by a dual structure, so that the Lewis cannot be directly applied.

Minami and Ma (2009, 2010) take a different approach. Specifically, they compare the wages of agricultural workers and wages for jobs that rural workers could take on relatively easily (such as the wages paid by town and village enterprises in China) on the one hand, and the wages for jobs requiring advanced skills in modern sectors of the economy (for example, wages in the machinery industry, in finance, and in public services) on the other. The comparison is based on the notion that in developing countries skills required in modern industries, similar to capital, are scarce, so that skilled workers receive higher remuneration than unskilled workers, of which there is ample supply from rural areas until the economy reaches the Lewisian turning point. Moreover, when the economy reaches the Lewisian turning point, the surplus of unskilled labor should disappear, which in turn should narrow the wage gap between skilled and unskilled workers.

Figure 5 shows the ratio of unskilled to skilled wages for China as well as for Japan for comparison. Starting with Figure 5(a), this shows how the wage gap in Japan narrowed rapidly from 1960 onward. On the other hand, as can be seen in Figure 5(b), in China the gap has been widening, and has continued to do so even in the late 2000s. As Minami and Ma point out, this suggests that the labor surplus in rural areas has not yet been depleted.[7]

Meanwhile, Han et al. (2007), using their own survey data, suggest that there were 100-120 million surplus workers in China. Similarly, Yao and Zhang (2010), using panel data by province, showed that both labor demand and labor supply were both increasing and argued that China had not yet reached the Lewisian turning point. Finally, Ding (2001), examining the

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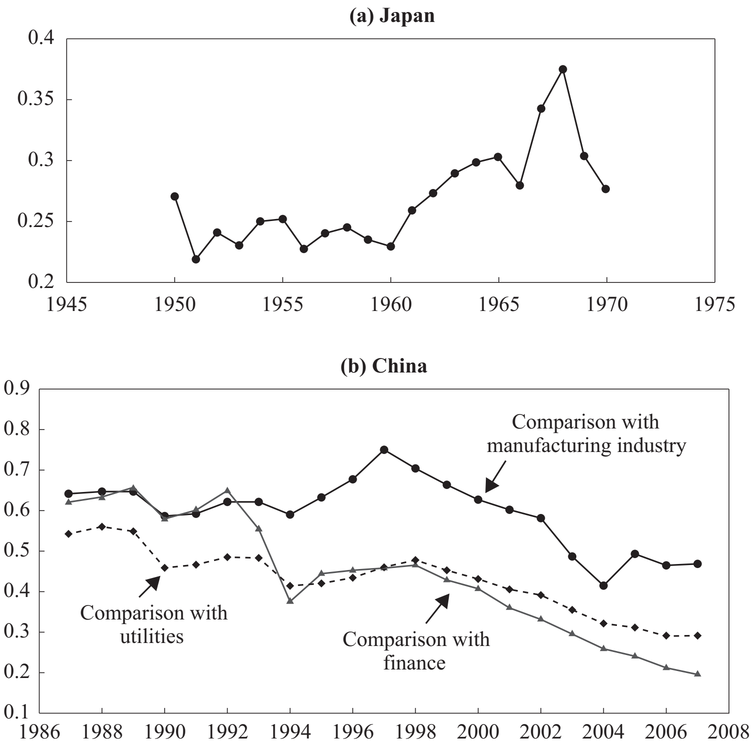
[6] For Taiwan and South Korea, studies such as Fei and Ranis (1975) suggest that they passed the Lewisian turning point in the late 1960s and early 1970s, respectively (also see Minami and Ma 2009, 2010). However, as Figure 4 shows, the primary sector employment share in Taiwan and South Korea was still very high — around 50% in both cases — at that time. Therefore, when determining whether China has reached the Lewisian turning point, we cannot do so purely on the basis of the primary sector employment share.

[7] Minami and Ma (2009) also estimated a production function for the agricultural sector in China and showed that the marginal product of labor was far below the wage rate in the agricultural sector. They conclude that there was still ample surplus labor in China. Similarly, Athukorala et al. (2009) also provide empirical evidence that the Chinese economy had not reached the Lewisian turning point.

FIG. 5. CHANGES IN THE WAGE GAP BETWEEN AGRICULTURE AND MODERN SECTORS: JAPAN AND CHINA



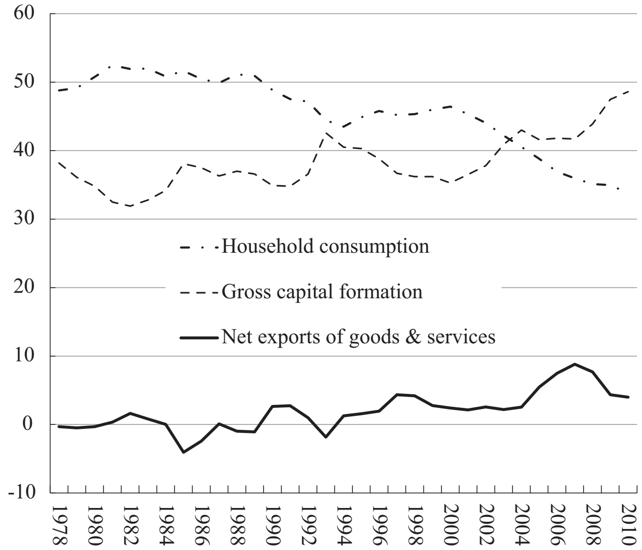
Source: Minami and Ma (2009).
Note: The figure for Japan shows the ratio of the wage of agricultural workers to the wage of production workers in the machinery industry (female workers are not included). The figure for China shows the ratio of wages paid by town and village enterprises to the wages paid in various modern sectors.

labor supply behavior of farming households, points out that household labor supply is determined by the division of roles within the household, so that wages may increase even if there is surplus labor within farming households.

Overall, therefore, although no clear consensus has yet emerged, the evidence on balance suggests that China has not yet reached the Lewisian turning point. For example, most analyses using microdata tend to support this view.

As our theoretical analysis in the previous section has shown, even at a relatively high GDP per capita level, an economy may not yet have passed the Lewisian turning point if the ratio of net exports of goods and services to GDP, η, or barriers to the movement of labor to the manufacturing industry, δ, are high. In the next subsection, we will examine China's economy focusing on these structural characteristics.

FIG. 6. COMPOSITION OF CHINA'S GROSS DOMESTIC EXPENDITURE (%)



Source: China Statistical Yearbook 2011.

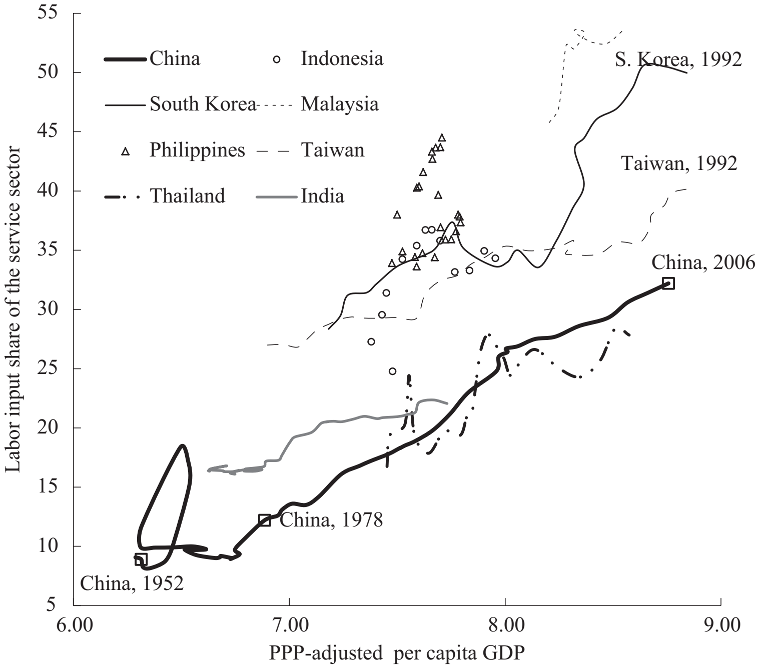
2. China's Growth Pattern and Industrial Structure

We start our examination of China's growth pattern and industrial structure by looking at the composition of gross domestic expenditure (GDE), which is shown in Figure 6. As can be seen, the share of household consumption in China's GDE is only 35%, which is very low by international standards. This low share is probably attributable to a number of structural factors, including the following: (1) a high propensity to save based on precautionary motives due to underdeveloped social security systems such as pension programs and medical insurance systems; (2) an extremely low labor income share, meaning that the greatest part of value added is business profits, a large part of which are reinvested; and (3) income inequality, which is further exacerbated by a regressive tax system relying heavily on indirect taxes.

As highlighted by Keynesian economics, weak private consumption demand will result in slow economic growth or recession, unless the gap is filled by investment, external, or government demand. As shown in Figure 6, in China the gap has been filled by extraordinarily high investment of almost 50% of GDP and, until the Lehman shock in 2008, a huge external surplus of around 5% of GDP, a level unrivaled by any major trading nation.

The dependence on external demand is attributable chiefly to government policy. Following the substantial devaluation of the RMB in 1994, China has maintained a weak RMB through a combination of strict regulations on inward portfolio investment, monetary easing, and active intervention in foreign exchange markets in order to maintain the price competitiveness of its export industries.[8] Foreign currency reserves have increased at a rapid pace since 2001.

FIG. 7. PPP-ADJUSTED GDP PER CAPITA AND SERVICE SECTOR EMPLOYMENT IN SELECTED ASIAN COUNTRIES



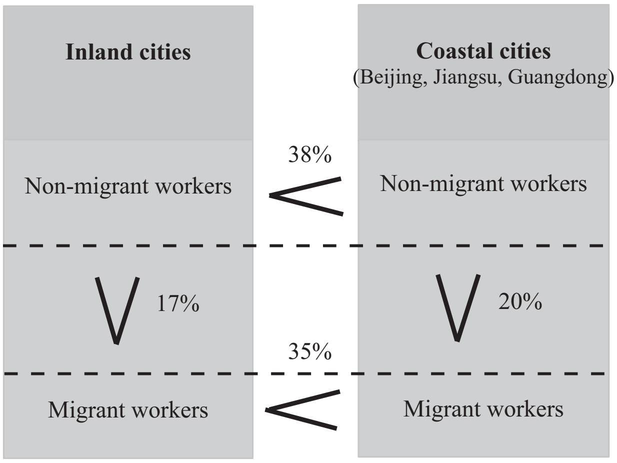
Source: Same as Figure 4.

Growth based on dependence on external demand is causing a number of problems. Given weak global demand following the collapse of Lehman Brothers and the sovereign debt crisis in Europe, China's exchange rate policy is beginning to receive international criticism as a beggar-thy-neighbor policy. In addition, there is a risk that China might experience economic turmoil with enormous economic and social costs like Japan did in 1973 and 1974, when there was runaway inflation, and following the collapse of the bubble economy of the late 1980s, if it continues with its exchange rate policy after reaching the Lewisian turning point. This is because, as mentioned in Section 2, an upward adjustment of the real exchange rate (a strong RMB) may occur not only through exchange rate changes but also through surging domestic wages and prices. Unlike Japan in the early 1970s, China has not liberalized international capital movements and can therefore prevent the appreciation of the RMB through intervention in foreign exchange markets. However, given the huge amount of foreign currency reserves and the rapid increase in the supply of high-powered money, China faces the risk of a jump in inflation that will be difficult to control once it takes hold.

Our theoretical model in the previous section showed that a country is slow to reach the Lewisian turning point if the ratio of net exports of goods and services to GDP, η, is high. In addition, if η is high, this reduces the share of the service sector in developing economies,

[8] Refer to Fukao et al. (2006) for a history of China's exchange rate policies.

Fig. 8. Average Wage Gap between Coastal Provinces and Inland Provinces and between Migrant Workers and Non-migrant Workers



Source: Authors' calculations.

whose exports consist mostly of goods rather than services. The service sector becomes smaller, because more resources are allocated to the export sector. To examine whether the data bear out this theoretical result, in Figure 7 we compare the service sector employment share across East Asian countries, including China, just like we compared the primary sector employment share in Figure 4. Figure 7 shows that the service sector employment share in China is very low compared with that in Taiwan and South Korea in the early 1990s. A possible reason why the employment share of the service sector is small is that, as pointed out by Yuan (2010), China curbed the development of its service sector before carrying out its reforms in the 1990s.

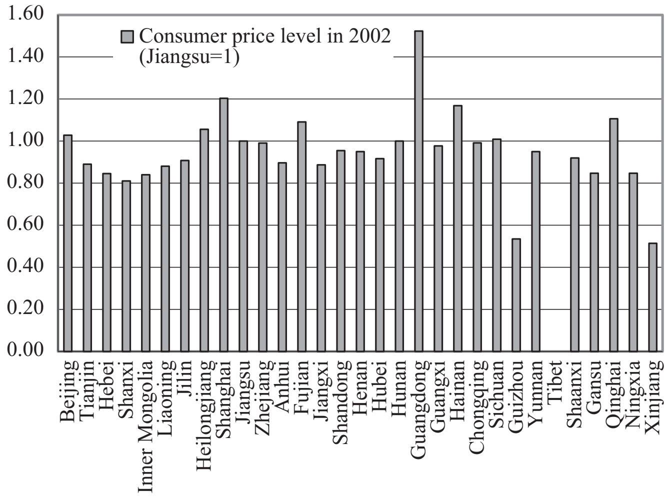
3. Barriers to the Movement of Labor across Sectors and Regions

Next, we examine barriers to the movement of agricultural workers to modern sectors, including manufacturing industry.

It has been pointed out that regulations, in particular the household registration system, have impeded the movement of labor from the primary sector, which is mainly concentrated in the inland provinces, to modern sectors, which are concentrated in the coastal provinces, and are one reason why there continues to be considerable surplus labor in the primary sector in rural China.

If there were no institutional barriers to the movement of labor migration and no costs associated with migration, we would expect workers with the same attributes to receive similar wages across regions and across sectors through arbitrage by workers. Therefore, examining the gap between the wage rates of workers in the inland provinces and workers in the coastal provinces and the wage gap between migrant workers and non-migrant workers should provide information on the economic effects of barriers to the movement of labor. We do so using microdata from the household budget survey of the 2002 China Household Income Project

FIG. 9. DIFFERENCES IN THE CONSUMER PRICE LEVEL AMONG PROVINCES (JIANGSU = 1)



Source: Authors' calculations based on data from the *China Statistical Yearbook* and the *China Price Statistical Yearbook.*

(CHIP) and measure the wage gap between coastal provinces and inland provinces and the wage gap between migrant workers and non-migrant workers, by estimating a Mincer-type wage function with additional variables to control for workers' sex, age, academic achievement, and the industry they work in. Figure 8 provides a summary of our estimation results.[9] The wage gap between migrant workers in inland provinces and migrant workers in coastal provinces (35% in Figure 8) can be thought to reflect the costs of migrating between provinces. Workers should be able to move freely as migrant workers if they pay these costs. On the other hand, the wage gap between migrant workers and non-migrant workers in coastal provinces (20% in Figure 8) can be thought to reflect the constraints relating to the household registration system preventing migrant workers from inland provinces from settling in the coastal provinces.

The important finding here is that the former gap is far larger than the latter. One would think that since they are already migrant workers anyway, migrant workers in inland provinces might just as well have moved to the coastal provinces, where wages are higher, than migrating within inland provinces. What is the reason that they choose not to do so?

The most important factor regarding the costs associated with migration are differences in price levels, which we examine next. However, China's consumer price statistics are not very useful for our analysis, since they include very few prices of services or housing rental. Therefore, using data for 2002, we produced our own estimates of differences across provinces in the absolute level of consumer prices, including prices of services for households and rents. The results are shown in Figure 9 and indicate that price levels in coastal provinces were far

[9] For the estimation of the wage function, the log of wage rates was used. In Figure 8, the results were converted back to the ratio of the original wage rates.

higher than those in the inland provinces. For instance, the price level for Guangdong Province, the highest, was more than three times as high as that for Guizhou Province, the lowest.

We then calculated the weighted average of price levels for the inland provinces and coastal provinces based on the data for Figure 9, using the number of wage observations for each province that we used to estimate the wage function for Figure 8 as weights. Our calculation suggests that the price level in the coastal provinces was 24.3% higher than that in the inland provinces. The difference in consumer prices is mainly caused by regional differences in rents and the far higher prices of services in the coastal provinces compared to the inland provinces, reflecting higher wage rates, land prices, etc.

The risk of unemployment in urban areas is another important determinant of the costs of migration. As Harris and Todaro (1970) have pointed out, in an economy that has not reached the Lewisian turning point, capital-intensive industries cannot absorb sufficient numbers of unskilled workers, and surplus workers become agricultural workers again or fall into a state of quasi-unemployment in the informal sector in urban areas. In the case of China, the unemployment rate in coastal provinces, especially in Guangdong Province, has indeed been rising in recent years, a trend that may discourage workers from migrating into coastal provinces.

Thus, given the very large differences in prices between coastal and inland provinces and unemployment in coastal provinces, and taking into account factors that are difficult to measure such as travel costs and the challenges associated with living in a different climate or culture, it may be quite rational for workers in inland provinces to choose not to move to coastal provinces. It could therefore be said that the movement of labor from the primary sector, which is concentrated in the inland provinces, has been delayed because working in the modern sector, which is concentrated in the coastal provinces, is not very attractive.

Overall, therefore, there are a number of factors, in addition to the household registration system, that likely have contributed to preventing agricultural workers from migrating to the modern sector. Unfortunately, it is beyond the scope of this paper to examine whether the barriers to the movement of labor in China are higher than those in other developing countries. This is an issue we would like to address in the future.

4. Industrialization with Weak Job Creation

Another important characteristic of economic growth in China is that China has promoted industrialization with a focus on capital-intensive heavy industries. Partly because of the influence of the Cold War, China has aimed for “full-set” industrialization from the early stages of its economic development. And although China has succeeded in fostering labor-intensive light industries as export industries since the reforms and opening up to the outside world embarked on in the early 1980s, China nevertheless continues to focus on heavy industry, mainly under the aegis of state-owned enterprises, in a way that other developing countries do not.

Let us consider the implications of this. Assume there are two countries, country *C* and country *J*. Country *C* is specialized in heavy industries, while country *J* is specialized in light industries. Also assume that the two countries have identical capital-labor ratios within each manufacturing sector. However, because country *C* specializes in heavy industries, which tend to require less labor than light industries, the demand for labor, especially unskilled labor, and compensation of labor in the manufacturing sector, are likely to be smaller than in country *J*. This type of industrialization, which absorbs less labor, may delay the point in time at which the economy reaches the Lewisian turning point.

In the previous section, for reasons of simplicity, we did not consider the industrial structure of the manufacturing sector and the effect of differences in capital intensity across different sectors. This means that unfortunately we were not able to apply our model from the previous section to this issue of industrial structure within the manufacturing sector. However, let us examine whether and to what extent changes in China's industrial structure have been leaning toward capital-intensive industries by comparing China's experience with Japan's.

Specifically, we investigate the lack of labor intensity (and hence capital intensity) of China's economic development using the labor input coefficient and comparing it with Japan's experience during the high-speed growth era. Doing so, we examine changes in labor intensity not in the manufacturing sector alone but in the economy as a whole.

An increase in the labor input coefficient (the number of employees divided by real GDP; denoted by Z) over time in the economy as a whole can be broken down into the effect of increases in the labor input coefficient within each sector and the effect of the expansion of labor-intensive sectors, that is:

$$Z^T - Z^0 = \sum_{i=1}^{n} (Z_i^T - Z_i^0)\overline{V}_i + \sum_{i=1}^{n} (V_i^T - V_i^0)(\overline{Z}_i - \overline{Z})$$

where Z_i denotes the labor input coefficient of sector i (the number of employees divided by real gross value added of sector i), and n denotes the number of sectors. V_i is the ratio of gross value added in sector i to total GDP. Superscripts T and 0 represent time. A bar above a variable shows that the variable is the average of that value at time T and time 0.

The first term on the right-hand side of the equation above shows the increase in the labor input coefficient in the economy as whole as a result of increases in the labor input coefficient within each sector. The second term shows the increase in the labor input coefficient in the economy as a whole as a result of an expansion of the share of value added in labor-intensive sectors. We call the first term the intra-industry effect and the second term the inter-industry effect. If the share of value added in labor-intensive sectors, where the labor input coefficient is higher than the average in the economy as a whole, increases, or if the share of value added in non-labor-intensive sectors declines, the inter-industry effect of those sectors become positive.

The results of our analysis are presented in Table 1, where changes in the labor input coefficient in the economy as whole are decomposed into the intra-industry effect and the inter-industry effect. For Japan, we concentrate on the period 1953-1968, when Japan is considered to have reached the Lewisian turning point, while for China we focus on the last two decades, which we break down into two subperiods, 1990-2000 and 2000-2008. The same industry classification is used for both countries. Table 2 shows the contribution of individual sectors to the inter-industry effect in China.

Starting with Table 1, the results imply that there is a substantial difference in changes in industrial structure between Japan around 1960 and China in recent years in terms of job creation. Both in China and Japan, the intra-industry effect has been or was large and negative, meaning that more labor-saving production pattern were employed within industries. However, while the inter-industry effect was positive in Japan, it has been negative in China. This means

TABLE 1. DECOMPOSITION OF CHANGES IN THE LABOR INPUT COEFFICIENT: CHINA-JAPAN COMPARISON (%)

		Change in input coefficient	Intra-industry effect	Inter-industry effect
China	1990-2000	−130.8	−111.9	−18.9
China	2000-2008	−95.4	−83.5	−11.8
Japan	1953-1968	−85.1	−89.2	4.1

that whereas the share of value added in labor-intensive industries expanded in Japan, it has shrunk in China. It is also important to note that the labor input coefficient in China has fallen much more sharply due to the intra-industry effect than it did in Japan. The labor input coefficient in China dropped by 130.8% in the 10 years from 1990 to 2000 and by 95.4% in the 8 years from 2000 to 2008. In comparison, in Japan the labor input coefficient declined by only 85.1% in the 15 years from 1953 to 1968.

One might think that the difference between Japan and China is due to the fact that China been experiencing exceptionally high growth. However, this cannot be the explanation: during the periods we focus on, GDP per capita in Japan actually grew by 12.3% per annum, which is higher than China's annual growth rate of 7.1%.[10]

In order to look for an explanation we therefore examine the contribution of each sector to the inter-industry effect, which is shown in Table 2. In China, the contribution of the manufacturing sector to the inter-industry effect was negative, which was not the case in Japan. Wholesale and retail trade, hotels, and restaurant, as well as community, social, and personal services, which are labor intensive industries, expanded in Japan and contributed considerably to the inter-industry effect, while in China the contribution of these sectors was small. It can therefore be said that changes in industry structure in both China's manufacturing sector and service sector reduced job creation, which is quite different from Japan's experience just before it reached the Lewisian turning point.

Another important factor underlying weak job creation in China, apart from the stagnation in labor-intensive industries pointed out above, probably is the allocation of capital across industries. Following its accession to the World Trade Organization in 2001, China has implemented policies giving preferential treatment to state-owned enterprises, and most capital has been invested in heavy industries. Yet, as alluded to above, policies emphasizing heavy industries tend to lead an increase in demand for skilled rather than unskilled labor. The policies may have prevented relatively uneducated and unskilled workers from participating in the modern sector, keeping them in low-income work in rural areas or in the informal sector in urban areas. A policy emphasizing state-owned enterprises is also likely to cause a number of economic problems. For example, there has been overinvestment in state-owned enterprises, which are protected and whose return on capital has been deteriorating rapidly. As a result, rather than reinvesting their ample funds in production, such enterprises have been investing in land purchases and stock markets. This is likely one reason for the excess liquidity and sharp rises in land prices in certain cities seen in recent years.

[10] Based on "Statistics on World Population, GDP and Per Capita GDP, 1-2008 AD" (downloaded from http://www.ggdc.net/MADDISON/Historical_Statistics/horizontal-file_02-2010.xls on March 18, 2011) created by Angus Maddison.

TABLE 2. SECTORAL CONTRIBUTION TO THE INTER-INDUSTRY EFFECT: CHINA-JAPAN COMPARISON (%)

	China 1990-2000	China 2000-2008	Japan 1953-1968
Agriculture, forestry, and fishing	−17.00	−8.90	−14.23
Mining and quarrying	−0.37	−0.66	−0.07
Manufacturing	−1.14	−1.63	4.18
Food, beverages and tobacco	*−0.07*	*0.09*	*0.40*
Textiles and textile products	*0.33*	*0.25*	*−0.05*
Leather and footwear	*−0.09*	*0.02*	*0.06*
Wood and products of wood and cork	*−0.09*	*−0.01*	*0.77*
Pulp, paper, printing and publishing	*−0.17*	*0.13*	*0.08*
Coke, refined petroleum and nuclear fuel	*0.32*	*−0.09*	*−0.02*
Chemicals and chemical products	*0.38*	*−0.23*	*−0.15*
Rubber and plastics	*−0.17*	*0.07*	*0.04*
Other non-metallic minerals	*−0.02*	*0.14*	*0.15*
Basic metals and fabricated metal	*−0.10*	*−1.07*	*0.27*
Machinery, nec	*0.13*	*−0.27*	*0.90*
Electrical and optical equipment	*−1.14*	*−0.37*	*0.59*
Transport equipment	*−0.45*	*−0.32*	*0.31*
Other manufacturing products; recycling	*0.00*	*0.01*	*0.84*
Public utilities	−0.59	−0.06	−0.57
Construction	−0.03	0.02	−0.59
Wholesale and retail trade, hotels and restaurants	−0.71	0.10	8.65
Transport, storage, and communication	−0.70	0.13	−0.34
Finance, insurance, and real estate	−0.53	−1.54	−0.22
Community, social and personal services	2.08	0.67	4.14
Government services	0.13	0.02	3.13
Total	−18.87	−11.85	4.10

V. *Conclusion*

To conclude, let us summarize the findings of our analysis. China's level of absolute prices converted using market exchange rates is low compared with the trend line estimated from cross-country data and the experience of other countries such as Japan and South Korea. The exceptionally low value of China's currency likely reflects not only its foreign exchange policies, including strict currency controls and large-scale foreign exchange interventions, but also the peculiarities of China's economic structure. Against this background, we constructed a three-sector growth model consistent with the Lewis model, where there is surplus labor in the primary sector, and examined the relationship between the process of economic development and the level of absolute prices. We showed that in a Lewisian situation with surplus labor in the primary sector, the absolute price level will remain low and that an economy like China's with high barriers to the movement of labor to the manufacturing sector and a large net export-GDP ratio will not escape from the Lewisian situation until GDP per worker becomes relatively high.

That China's real exchange rate has been undervalued likely is due not only to China's policy of maintaining a weak RMB but also to the structural factors described above. However, if the structural factors disappear, or if the Chinese economy reaches the Lewisian turning point, strong upward pressure on the RMB will likely emerge, and maintaining a weak RMB through intervention will very likely generate serious inflation. Meanwhile, increases in the wages of unskilled workers will remain subdued until the economy reaches the Lewisian turning point. Finally, it is important to note that many of the policies delaying the economy from reaching the turning point are also making income disparities in China more serious.

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