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On the Shoulders of W. Arthur Lewis:

In Commemoration of the 60th Anniversary of the Lewis Model

by

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Abstract

This year, 2014, marks the 60th anniversary of the publication of Sir W. Arthur Lewis's groundbreaking paper entitled "Economic Development with Unlimited Supplies of Labour". Compared with most papers written to celebrate Lewis's 1954 paper, which put their emphases on assessments of Lewis's achievements, this one proposes new research to advance Lewis's studies of the transfer of labor from agriculture. I argue that perhaps the most important, if unintended, contribution Lewis made in his famous paper is his depiction of the transfer of labor from agriculture to nonagriculture because that transfer is the key phenomenon in the historical process of de-agriculturalization that began around 300 years ago and continues today. I consider that Lewis's dualistic approach to the study of labor transfer is powerful since only his approach is compatible with an economy-wide equilibrium when sectorial productivity gaps persist. But the transfer of labor in the process of de-agriculturalization proceeds far beyond Lewis's depiction of the transfer of surplus labor. And I contend that the concept of labor transfer is insufficient to describe and analyze the process of de-agriculturalization. Knowledge of the transfer's speed is needed, for example, to determine the requirements for new capital and the agricultural product surplus that are required for transferring a given amount of labor from agriculture during a given period. The speed of labor transfer may qualify as a new, important question for research on the process of de-agriculturalization in the developing economies.

Keywords: Lewis model, Labor transfer from agriculture, De-Agriculturalization, Speed of labor transfer

JEL Classification No.: B25, O10, O41

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1. Introduction

The year 2014 witnesses the 60th anniversary of the publication of Sir W. Arthur Lewis's seminal paper entitled "Economic Development with Unlimited Supplies of Labour" (1954). In this paper, Lewis presents a concept of "surplus labor" and analyzes the transfer of surplus labor into productive activities by setting up a dualistic model, which helped lay the foundation that established development economics as an academic discipline in the following years. It also helped earn Lewis the Nobel Prize for Economics in 1979. Findlay (1982: 3) even asserted that a large part of the subsequent literature on development economics can be viewed as "extended commentary on the meaning and ramifications" of the ideas of Lewis's 1954 paper.

It is not surprising that the Lewis 1954 paper, with its unconventional concept of surplus labor and approach of dualism, has provoked many critiques while inspiring extensive extensions and refinements (Lewis, 1980). On the 50th anniversary of the Lewis paper in 2004, development economists placed emphasis on their assessment of Lewis's contributions to development economics and policy, and especially on the validity of the surplus labor concept and the dualistic approach formally introduced by Lewis.¹ Now on the 60th one,² I prefer to change emphasis to the possibility of new research projects building on the Lewis 1954 paper. The prospects of further valuable insights are made possible because we now stand on the shoulders of a giant – Lewis -- as Isaac Newton might say, thus enabling us to see further.

¹ Two academic journals, *The Manchester School* (2004), the journal in which Lewis's 1954 paper appeared initially, and *Social and Economic Studies* (2005), devoted special issues to commemorate the 50th anniversary of the paper's publication.

² The 60th anniversary of an event is highly valued in the Chinese culture since the Chinese calendar, which is still in use next to the Western one in China today, takes 60 years as a cycle.

In what follows, I first consider the Lewis question of labor transfer from agriculture into nonagriculture in the broader perspective of the history of humankind in Section 2. Lewis was the first economist to advance the question of labor transfer as an independent topic for economic investigation, and this is the question that lies at the core of research on de-agriculturalization, that is, the transition of the human beings from the agricultural era to the post-agricultural one. Section 3 will revisit Lewis's dualist approach and surplus labor concept and show their validity for, and limitations in, research on de-agriculturalization. Section 4 will expand on the question of labor transfer to consider also the issue of the transfer's speed, demonstrating that research on the latter issue could provide valuable insights for developing countries in which the labor exodus from agriculture continues, at present and for the immediate future.

2. Labor Transfer in Broad Historical Perspective

In my view, the most important contribution Lewis made to economic research with his 1954 paper is not the concept and approach mentioned above, but his consideration of the transfer of labor from low-productivity agriculture into far more productive nonagriculture ³ or, in Lewis's terms, from the traditional sector to the capitalist one. ⁴

³ Einstein and Infeld (1938: 92) elegantly pointed out the vital importance of formulating questions for scientific progress by saying: "The formulation of a problem is often more essential than its solution, which may be merely a matter of mathematical or experimental skill. To raise new questions, new possibilities, to regard old problems from a new angle requires creative imagination and marks real advances in science."

⁴ Lewis (1979: 211) renamed his two sectors traditional and modern, "such that the modern sector grows by recruiting labor from the traditional." Presumably, he intended to include, through his renaming, the then "socialist economies" in his theory because there is also the transfer of labor from the lower productive sectors to higher-productive ones in these economies.

I emphasize labor transfer from agriculture to nonagriculture because the current process of economic growth and development can be understood as one of “de-agriculturalization”, in which humans are transitioning from an agricultural to a post-agricultural society. As one of the main characteristics of this de-agriculturalization, labor will transfer from agriculture to nonagriculture. Lewis’s examination of the transfer of surplus labor from agriculture focuses on this phenomenon, although he ignores the broader issues associated with de-agriculturalization.⁵

Lewis asserted at the very beginning of his paper that he was “asking the classical question” (1954: 139). But the question of labor transfer out of agriculture is not analyzed, or at least not explicitly analyzed, by the classical economists as a group. For example, Smith (1776) concerned himself more with the functionality and welfare meanings of the emerging market systems, while Ricardo (1817) posed questions to himself about the laws governing income distribution among three classes: capitalists, landowners and laborers. In fact, most classical economists, whether they agreed with Malthus (1798) or not, did not dare to imagine technological progress in agriculture that would enhance production of food at a speed to at least keeps pace with population growth. Therefore,

⁵ Admittedly, Lewis’s two sectors are not the agricultural and the nonagricultural ones, but the traditional (or subsistence) and the capitalist sectors. To the critics who identified Lewis’s two sectors with different products, Lewis (1968) reminded them to read his 1954 paper where he explicitly listed domestic servants, petty traders and other urban informal occupations as contributors to the labor that needed to be transferred. Therefore, Lewis’s concept of the transfer of labor differs from what I emphasize in this paper. However, Lewis’s transfer transforms easily into mine because, beside the historical trend of de-agriculturalization mentioned below, the bulk of Lewis’s surplus labor exists in agriculture and the lower-productivity urban jobs can be seen as intermediate or transitional forms of the transfer of agricultural labor into higher-productivity nonagriculture. The division of agriculture and nonagriculture in development economics may be first made by Ranis and Fei (1961). In *The Manchester School’s* special issue to celebrate Lewis’s 1954 paper, Ranis (2004) continued to identify agriculture and nonagriculture for Lewis’s two sectors, while Figueroa (2004) criticized this “misunderstanding” of Lewis’s original ideas.

for the classical economists, pressure to maintain, not to say to increase, food supplies per head merely for subsistence compelled the economy to retain a large share of the labor force in agriculture. With this as background, it is unrealistic to have expected them to raise questions about labor transfer from agriculture.

Of all classical economists, Marx (1867) may be the only one who dealt with the transfer of part of the agricultural labor force in some detail, but in the last part of his long book “Capital”, 1st volume. However, the transfer sets up for him only a pre-phase of capitalist development that he labeled “primitive accumulation of capital”. After that phase, traditional agriculture is transformed into the capitalist production mode with the three classes that Ricardo first clearly formulated. Therefore, on the one hand, it was inconceivable for Marx that most agricultural labor could be transferred into nonagriculture. On the other, the transfer of agricultural labor was not regarded by Marx as an independent question in his research on the laws of motion of the capitalist mode of production.

It is Lewis who introduced the question of labor transfer, though in the form of surplus labor transfer, into academic research on the less-developed or developing economies. It also distinguishes Lewis from other development economists in the middle of the 20th century. At that time, the advanced economies in Europe and North America seemed to have escaped successfully from the Malthusian trap. Modern technologies had been used widely in agriculture, which led to increases in food supplies much above the pace of population growth. At the same time, population growth diminished.

Oversupplies of food even became an economic problem confronting economists during the first half of the 20th century. One of the New Deal measures proposed by President Roosevelt was agricultural subsidies in exchange for decreasing farm production. The decline of population growth also was one of the reasons behind Alvin Hansen’s views about secular stagnation (1939). As a result of both developments,

freedom from food shortages in the advanced economies became a fact for economists of all schools. Therefore, the pessimistic views about economic growth held by the classical economists, based on a secular shortage in food, passed into history. The widespread current belief was that capitalist production can, though with repeated economic crises, raise the standard of living far above the subsistence level even for ordinary persons and “proletarians”.

This atmosphere must have affected Lewis’s thoughts about the development of less-advanced economies in Asia, Africa and Latin America. As Tignor (2006: 273) pointed out, Lewis’s 1954 paper and his 1955 book “epitomized the optimism of this period and reflected a faith in newly independent countries. In Lewis’s view, developing economies, rightly guided, could achieve dramatic economic progress.” The optimism may explain why Lewis did not even mention pressure of food supplies explicitly in his 1954 paper, where he describes labor transfer from agriculture without considering whether or not that transfer might reduce food supplies.⁶

But optimism was only one aspect of the academic atmosphere regarding research on developing countries at that time. The predicament regarding how to “guide rightly” was another. An editorial (1952: 3) in the journal of “*Economic Development and Culture Change*” written for its launch found that the discussions on growth of the developing economies “remain presentations of individual viewpoints or at best they produce long lists of ‘important’ but unranked factors.” He said further: “Even a casual glance at the

⁶ That may be because Lewis takes neither population growth nor a rising real wage into account. Therefore demand for agricultural output will not increase. On the supply side, he observes agricultural labor in terms of a man or man-year, not a man-hour. In subsistence agriculture, the departure of a worker would be compensated by the expanded effort of the under-employed workers who remained. Therefore, though the marginal product of labor was positive, the transfer of an agricultural laborer would not cause a fall in total agricultural output. See Lewis (1968) for his explanation. I thank Nicholas Hope for drawing my attention to these points.

existing literature reveals not only the absence of a satisfactory theory but also the absence of agreement as to which of the many problems apparent to the observer are important for study. The research worker seeking pathways to adequate theory finds no blazed trails, but instead a veritable jungle of vicious circles, obstacles to change, and necessary (but never sufficient) preconditions for economic growth.”⁷ From here it was Lewis who, with genius, seized the well-known fact that redundant labor existed in the agricultural sectors of virtually all developing economies from the “long lists” of the contributors to the backwardness phenomenon and made the transfer of this labor into productive employment a key driver of economic growth for developing economies. The doctrinal history of development economics so far establishes that, of all contributions made by the earlier development economists during and after World War II to understanding economic development, Lewis’s 1954 paper with its approach to this question probably has had the most lasting effects “upon the scope and direction of thinking on development as a process of structural transformation” (Kirkpatrick and Barrientos, 2004: 683).

Now standing on the shoulders of Lewis, allows us to see farther and go a step further, even though our knowledge is still limited. From the perspective of the whole human history of around 270 million years, the aspects of agricultural labor transfer that Lewis first formulated could have wider meaning for economic research than Lewis might have thought. Humankind has experienced and is experiencing two “great transitions” in the history of its economic life so far. The first was from hunting and gathering to agriculture;

⁷ Schultz (1956: 372) once said rightly, but empty: “To achieve economic growth of major importance in such (*developing*) countries, it is necessary to allocate effort and capital to do three things: increase the quantity of reproducible goods; improve the quality of the people as productive agents; and raise the level of the productive arts.” He (1964) investigates equilibrium of traditional agriculture successfully, but cannot set up a theory to demonstrate how the equilibrium can be broken beside to “improve the quality of the people”. (Italic word added by the author of this paper.)

the second is from agriculture to nonagriculture. The transitions could be named agriculturalization and de-agriculturalization, respectively.

Historians believe that there were rapid increases in income per capita with rapid growth of human population during the process of agriculturalization (Stavrianos, 1999; Toynbee, 1972). Partly through our own personal experiences, we also know that rising per capita incomes have accompanied the ongoing period of de-agriculturalization that began first in Western Europe around 1700. Kuznets (1966) labels the economic history since then “modern economic growth”. Historians in a thousand years might rename it de-agriculturalization, or more appropriately given the associated desirable outcomes, with a more “positive” designation,⁸ since one of the unique characteristics that distinguishes our time from earlier times is less the rapid growth of per capita income in general, but more the transition from agriculture to nonagriculture in particular.

Drawing from Lewis, we can recognize that questions about labor transfer from agriculture are fertile ground for research on agriculturalization as well as de-agriculturalization because, first, reallocation of labor is one of the striking

⁸ I recognize that “de-agriculturalization” conveys something of a “negative” context, but that seems prudent as we cannot know with certainty the ultimate impact of the era of de-agriculturalization on the economy and society. Titles that are sometimes used to label the future economy, such as post-industrialization, post-modern, post-development, knowledge, information economy, service economy, and so forth, seem either too narrow or too general to be taken seriously in conceptualizing the economic future after de-agriculturalization. Recall that historians were able to name the first great transition agriculturalization only when it went through the transition and arrived in the society after. We now remain in the middle of agriculturalization and have insufficient knowledge to predict with any confidence what the future might bring. An example illustrates our nescience. The products of agriculture and nonagriculture are complementary so far and may still be so in future, while those of hunting and gathering and agriculture were largely substitutable. Current circumstances prevent humankind from anticipating with any certainty whether agriculture could be replaced, largely or even entirely, by non-agriculture in coming decades or centuries. Hence, we do well to avoid labels for the second great transition that tend to anticipate an unknown and unknowable future. For more on the anthropology of development, see e.g. detailed discussions in Edelman and Haugerud (2005).

characteristics of both transitions and, second, labor transfer is both easy to define and understand if “human capital” or changes in human physiology and intelligence are neglected.⁹ And with measures such as the shares of labor or employment engaging in agriculture, we are able to refer to the first great transition as a process of rising shares and the second as one of falling shares.¹⁰

According to the study of the human history, agriculturalization began from around 12,000 years ago and was essentially completed around 7,000 years ago. After that, humankind dwelt in an agricultural economy and society for more than 6000 years. Then the process of de-agriculturalization began about 300 years ago. The process of de-agriculturalization continues at present and will continue in the near future. Let us assume that the agricultural labor share (ALS) would be around 80% in a typical agricultural society. Then human history can be represented by means of the ALS as in Figure 1 below. By the assumption, the ALS rose from zero to around 80% during the agriculturalization process that took place over about 5000 years. That share then stabilized during the “agricultural phase” of human history. From around 1700 on, the ALS then began to fall; the process of de-agriculturalization had begun. Some 300 years later, in 2000 the ALS had declined to around 38% for the whole world (ILO, 2012). It is falling continuously at present and can be predicted to approach zero at some point in the future.¹¹

⁹ The biggest advantage of labor share is its simplicity when changes in human potential are neglected. By comparison, most material, economic, social and cultural indicators suffer from measurement problems (e.g. the agricultural share of aggregate output) or do show trends that are inconsistent with the history of de-agriculturalization (e.g. food consumed per head).

¹⁰ Even historians find such measures useful. For example, Stavrianos (1999: 34) guessed that “by 1500 B.C.E., the hunters, who in 8000 B.C.E. had comprised 100 percent of the human race, had shrunk to little more than 1 percent of the population.”

¹¹ The ALS cannot fall to zero if non-agriculture remains a less-than-perfect substitute for agriculture. Hence the zero ALS represents just a simplified abstraction of the end result of de-agriculturalization.

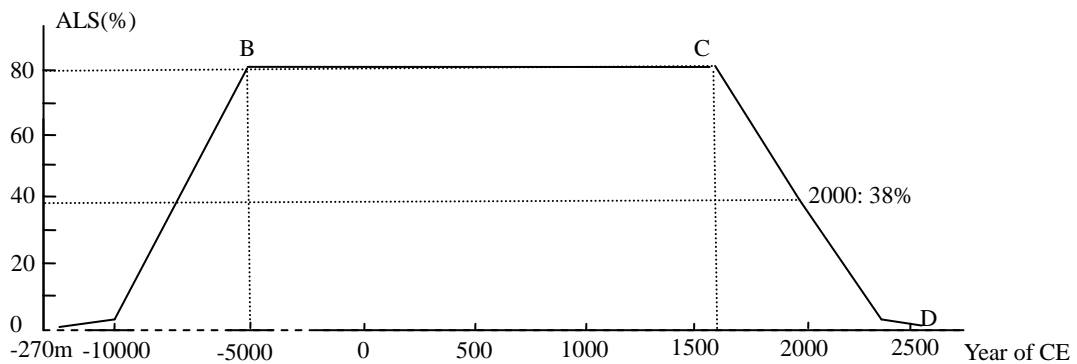


Figure 1: Two Great Transitions Described by Changes in the ALS

Note: In order to represent the de-agriculturalization process more clearly, the curve depicting the falling ALS was intentionally drawn less steeply.

We look at the process of de-agriculturalization in more detail in Figure 2, where it is divided into three periods. The first is from around 1700 to 2000, in which the ALS fell 42 percentage points from its assumed initial level of 80%. The second comprises 2000-10, a period for which we have information, particularly statistical data, on changes in the ALS for the whole world as well as for most individual countries, especially the populous ones. Accordingly, this period is of particular significance for research on the ongoing de-agriculturalization process. The third period can be viewed as starting in 2010 and extending into the indefinite future, during which the ALS will fall further and eventually approach zero.

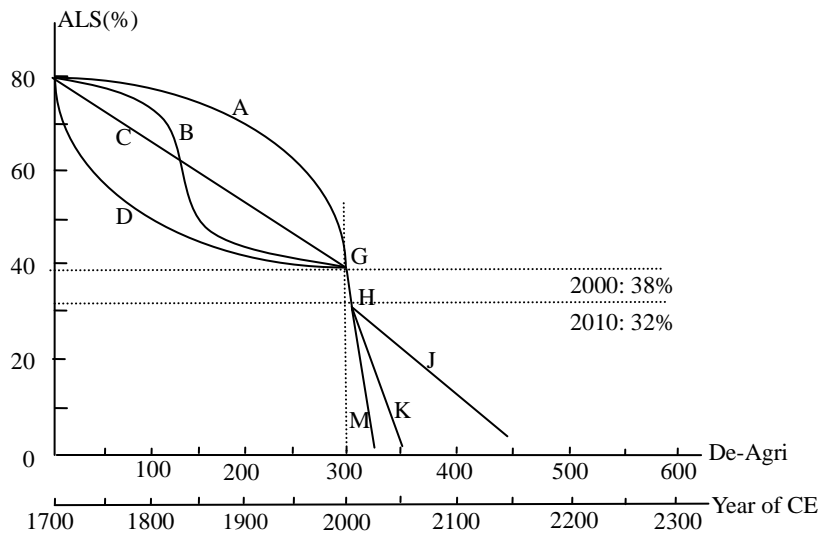


Figure 2: The Process of De-Agriculturalization

Research with data from the International Labor Organization (ILO, 2012) indicates that the world's ALS was around 32% in 2010, implying a fall of six percentage during the decade. Assuming this speed could apply to the whole de-agriculturalization process, humankind could witness a reduction in the ALS to nearly zero within less than 140 years. In consideration of both 300 years of de-agriculturalization history and the world's ALS of 38% in the year of 2000, the first decade of the present century must be one of the periods of most rapid decline in the ALS during the whole history of de-agriculturalization.¹² If this trend continues, the ALS could approach zero even in the present century. However, the fall in ALS may take longer or even much longer if certain disadvantageous events caused by nature (e.g. impacts of climate change) and/or humans

¹² Hobsbawm (1994) argued in favor of the Soviet system because it accelerated the transfer of labor from agriculture when the transfer is regarded as a historical trend. On the contrary, as indicated here, the two decades following the collapse of the Soviet system comprise one of the periods of most rapid decline of the ALS in the history of de-agriculturalization to date.

(e.g. wars of large scale) occur.

Because the process of agriculturalization as a whole was completed around 7000 years ago, there is little evidence in material artifacts and written accounts about its course that are available to inform the research of later generations trying to study it. Consequently, later generations have great difficulty in understanding and theoretically “reconstructing” the process with any real certainty. Recent generations are immersed in the process of de-agriculturalization and possess tools, including writing techniques and analytical methods, that were unavailable to the generations experiencing agriculturalization. Therefore, we are in an inherently better position to comprehend what is happening to us than was the case for those earlier generations. Nevertheless, we still know comparatively little about the progress of de-agriculturalization. For example, we do not know which of the four curves: AG, BG, CG and DG in Figure 2 better represents the historically falling path of the ALS from 1700 to 2000. But on the shoulders of Lewis with labor transfer as the central question for research, we may be able to apply the available knowledge on de-agriculturalization to develop insights into what the future holds.

3. Dualist Approach and Surplus Labor Concept Revisited

Research on de-agriculturalization can be divided into two interconnected, but different, types. The first type concerns de-agriculturalization’s origination or how it has been driven into motion; it is similar in nature to the question of the first cause Newton posed for physics.¹³ The second type concerns the “laws of motion” or how it proceeds. Lewis’s work belongs to the second type. Although Lewis wrote many papers and books

¹³ Research of this type usually falls under the classification “origin of capitalism”. One of the best investigations of this type is Weber’s *General Economic History* (1923).

describing the European and global economic experience of de-agriculturalization,¹⁴ his analytical investigations on the laws of de-agriculturalization outshine his economic history research. Not only the Lewis analysis of labor transfer, but also his concepts of dualism and surplus labor, which we revisit in this section, have contributed to our understanding of the laws governing the de-agriculturalization process.

With regard to Lewis's dualist approach, we observe that agriculture and nonagriculture, between which labor transfers, co-exist during the process of de-agriculturalization as gathering and hunting did with agriculture during the process of agriculturalization. However, this co-existence does not necessarily lead to a dualistic analysis of de-agriculturalization. Classical economists, for example, did not employ the modern dualistic approach in their research on the economic development of the Western Europe of their time. Instead, they dealt with sectors and the transfer of labor between them with the same terms such as the natural wage rate.¹⁵ One of the reasons for their unitary approach may be that, at their time, population pressure was felt everywhere in the economy and no barriers were erected by governments, unions or other agencies against the free movement of laborers between sectors, regions and rural and urban areas (Phillips, 1965). After the marginalist revolution, the neoclassical economists neglected dualism as much as did the classical ones. In fact, the newest research subfield under the title of "Structural Change," which analyzes changes in the relative importance of agriculture, manufacture and service industries during the second great transition, is

¹⁴ The Nobel Prize Committee (1979) mentioned four of Lewis's many publications explicitly in citing his academic achievements, i. e., his 1954 paper and three other writings: "Theory of Economic Growth" (1955), "Aspects of Tropical Trade, 1883-1965" (1969) and "Growth and Fluctuations, 1870-1913" (1978). The last two publications deal with economic history in relation to de-agriculturalization.

¹⁵ Classical economists, especially Quesnay (1758) and Smith (1776), advanced different criteria to divide economic activities into productive and unproductive ones, a dualist approach that is not used by Lewis or other development economists.

based on the marginalist approach.

To make the marginalist approach valid for the whole economy, labor productivity must be assumed identical across sectors within the economy; otherwise, the economy cannot achieve equilibrium. Therefore, the three propositions of (1) equilibrium, (2) same productivities across sectors and (3) unitary marginalist approach are interdependent.¹⁶ Neoclassical economics encounters difficulty here because agricultural productivity has been far lower than nonagricultural productivity in almost every country and every period since de-agriculturalization began around 300 years ago.¹⁷ In the middle of the 20th century, agriculture became a peripheral industry in the advanced countries and could be overlooked by “macroeconomics” to some extent.

But in the developing economies, “there is usually a marked difference between incomes per head in agriculture and in industry”, as Lewis (1955) found. Obviously the first and third proposition above cannot be valid simultaneously if the second proposition is broken. Based on the intellectual progress marked by the marginalist revolution in economics, the 20th century economists could not revert to the classical unitary approach. With equilibrium as a theoretical necessity and the productivity gap as an empirical fact, an imperative for them was to find a dualist approach to explain how an economy-wide equilibrium is achieved with an inter-sectorial productivity gap. Lewis was the first to analyze the labor transfer during de-agriculturalization by introducing economic dualism.¹⁸ At the celebration 50 years after the publication of Lewis’s 1954 paper, his

¹⁶ Barro (1997) shows why uniform productivity must be assumed for labor market equilibrium based on the marginalist approach.

¹⁷ The newest study on the productivity gap between agriculture and nonagriculture (Gollin, Lagakos and Waugh, 2014) finds, even after taking many measurement issues into consideration, “a puzzlingly large agricultural productivity gap”. The authors estimate the value of output per worker in nonagriculture appears to be “roughly twice as high as in the typical country, and even higher in the typical developing countries” (p. 990).

¹⁸ Tignor (2006: 84) said “Lewis was at heart a general equilibrium theorist, believing that no part of

novel approach was praised by many development economists. In fact, as long as both a considerable productivity gap between agriculture and nonagriculture and a large ALS exist in an economy, the dualist approach Lewis advanced will have validity, “until the cessation of population growth and immigration create a single market for labor” (Lewis, 1979: 228).

With identical labor productivity across the sectors, neoclassical economics further rules out effects on aggregate output from labor transfer. A laborer who transfers from A-sector to B-sector will increase output of the B-sector while decreasing that of the A-sector by the same amount if there is no productivity gap between the two sectors. Therefore, labor transfer between sectors leaves aggregate output unaffected and is of no macroeconomic importance (Barro, 1997). In other words, the productivity gap across sectors, logically, must lead to macroeconomic effects of labor transfer between these sectors. Thus, the transfer of labor from lower-productivity agriculture into higher-productivity nonagriculture will expand aggregate output (other things equal) because the agricultural output lost from the transfer is less than the increased nonagricultural output that it induces.¹⁹ In fact, the faith of Lewis and other development economists in the “dramatic economic progresses” that the developing economies could achieve (Tignor, 2006: 273) is, first of all, based on the remarkable productivity gap between agriculture and nonagriculture. But here again, the dualist approach is necessary to specify and analyze the macroeconomic effects of labor transfer of the Lewis kind,

the development picture could be separated from the rest and that economic imbalances, say a rapid increase in investable capital or large, unproductive labor forces in the countryside, would reverberate through the economy until a state of balance was achieved.” In comparison to Lewis, Schultz (1964), by using the unitary marginalist approach, found equilibrium in traditional agriculture, but could not make the extension to an economy-wide equilibrium.

¹⁹ Lewis (1958: 8) particularly stressed the “superior productivity of the capitalist sector” and asserted that a laborer transferred from traditional agriculture into the capitalist sector “raises the national income, increases the total surplus over wages, and so makes possible further expansion.”

since only this approach allows for the productivity gap.

The essential question Lewis confronted consciously 60 years ago concerned neither labor transfer nor the dualist approach, but was to explain why the classical natural or constant wage persisted in the agricultural sectors of the developing economies while the marginal principle of the pricing of productive factors, including labor, governed the capitalist (nonagricultural) sectors. The constancy of the wage level is the “classical question” that Lewis particularly emphasized and tried to answer in his 1954 paper. The classical economists, no matter how different they are in philosophy and methodology, are similar in their explanations, which depend on population growth and constraints on food production.

For post-WWII economists, both explanatory factors are generally no longer valid. Hence, a big intellectual challenge to economists at that time was to explain the mechanism of wage determination in lower-productive agriculture, even if labor transfer is taken as a core driver of economic development and the dualist approach is accepted. Lewis invented the concept of “surplus labor” to answer this classical question. High availability of labor with very low productivity was one of the apparent phenomena of economic backwardness well known to all economists at the middle of the last century. Lewis conceptualized that particular phenomenon in his “surplus labor” and established it as the main explanatory factor for why the real wage could be maintained at the subsistence level.

The concept of surplus labor enabled Lewis to build his theory of wages and then of labor transfer in a self-consistent form. It can be stated succinctly as follows. In a special case, when the marginal product of agricultural labor is just zero, the wage rate will be fixed at the subsistence level for institutional reasons. Agricultural labor will transfer into capitalist nonagriculture on this wage level as new capital is accumulated in nonagriculture, during which the labor transfer leads neither to wage increases nor to

food shortages until all surplus labor has been absorbed by nonagriculture. Because the wage rate does not rise and the total labor stock is constant, the “wage funds” will not expand, with the results that (i) the demand for agricultural product does not rise (so the goods markets are still cleared) and (ii) the expansion of nonagricultural production will enlarge only profits, which are, in turn, again added to the stock of capital for further expansion. In this manner, the developing economy will grow, finally becoming an advanced one where all surplus labor is absorbed and the marginal productivity of agricultural labor matches that of nonagricultural labor. From this point on, the wage rate will rise along with increases in labor productivity as a result of new capital invested in production, and the dualist approach stop functioning.

What is noteworthy is that, first, Lewis redirected the emphasis in explaining a “natural” or constant real wage away from the population growth of classical economics to aspects of the existing population stock,²⁰ and, second, he redirected the emphasis of research on the growth of developing economies from labor transfer to capital accumulation, as he himself expressed (1954: 155): “The central problem in the theory of economic development is to understand the process by which a community which was previously saving and investing 4 or 5 per cent of its national income or less, converts itself into an economy where voluntary saving is running at about 12 or 15 per cent of national income or more.” Therefore, Lewis ensured that the main contents of his 1954 paper endeavored to explain sources of both surplus labor and investment funds.

Today, with the perspective that Lewis and other development economists have provided, we should see farther. First, we witness the co-existence of the marked sectorial productivity gap and the real wage increase in almost every country experiencing economic growth. Taking this co-existence as an empirical premise, the dualist approach still has validity after wages start to increase, meaning that the approach may have more

²⁰ Ranis (2004) provides an excellent description of Lewis’s departures from the classical economists.

staying power than Lewis himself imagined.²¹

In contrast, Lewis's concept of surplus labor faces much stricter limits than Lewis thought. For Lewis, surplus labor and the productivity gap were two sides of a coin. We revise and extend a figure from Lewis's 1954 paper into Figure 3 below. The axes L and MP in Figure 3 stand for labor and its marginal product and superscripts A and N for agriculture and nonagriculture, respectively, while w denotes wage rate and w_E the subsistence wage. The downward MP^N -curves represent nonagricultural demands for labor and the horizontal curve of w_E the unlimited supply of labor. Assuming there is initial surplus labor of OS in the economy, during the transfer of this labor to nonagriculture the labor market will equilibrate at the points where the MP^N -curves intersect the horizontal part of curve w_E . Hence the realized MP^N and w will remain constant at the level of w_E . Only after all surplus labor finds employment in nonagriculture and the economy reaches the turning point T (Ranis and Fei, 1961), will MP^N and w begin to increase.

²¹ The productivity gap is seen as resulting from misallocations of labor and other productive resources between agriculture and nonagriculture in the newest "misallocation" literature. But misallocations of this kind are so great that their elimination might take a few centuries and their analysis might require the dualist, approach. Referring to the misallocations between nonagricultural firms, Banerjee and Moll (2010: 202) find "the transition to the stationary state from a highly distorted initial allocation (think of India or China before liberalization) can be quite slow in the presence of financial constraints, and therefore, in the short to medium run, we will continue to observe a lot of misallocation."

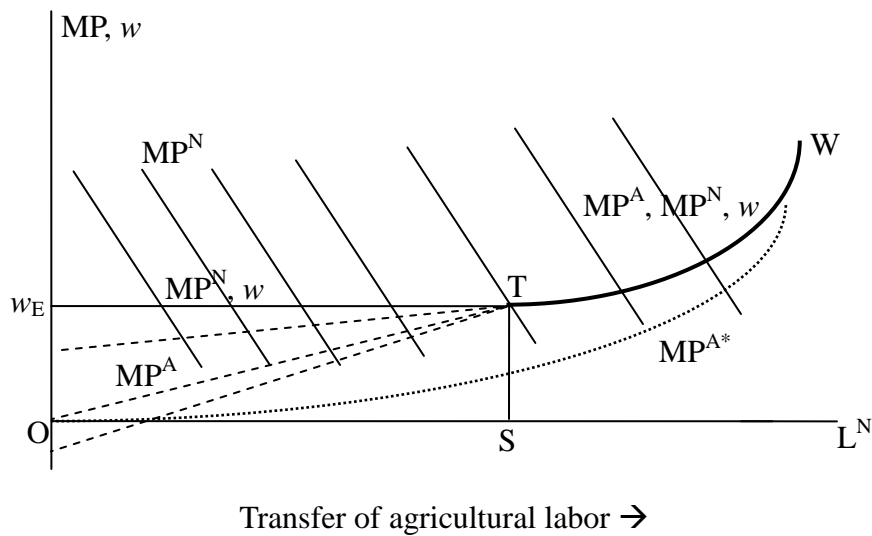


Figure 3: Productivities of Agricultural and Nonagricultural Labor

Source: Figure 3 in Lewis (1954: 151) with revisions and extensions.

The curve $w_E TW$ in Figure 3 represents Lewis's wage dynamics. We add three MP^A -lines in Figure 3 that denote positive, zero and negative MP^A at the onset of the labor transfer, respectively, as Lewis once said about the possibilities for the initial MP^A (1954: 191). All of the three possible MP^A -curves are much lower than w_E and MP^N initially. According to Lewis, the MP^A will increase during the process of surplus labor transfer, finally matching MP^N at the turning point T, as shown in Figure 3. Therefore, the elimination of surplus labor marks the convergence of agricultural and nonagricultural labor productivities. In this sense, the dualist approach applies only to the process of surplus labor transfer; and Lewis's view of the transfer of agricultural labor applies only to surplus labor.

Today, equipped with much better productivity statistics, we recognize the large difference in labor productivity between agriculture and nonagriculture, even in the

world's most advanced countries where surplus labor in Lewis's sense is nonexistent. The historical evolution of the path of MP^A is probably more closely represented by MP^{A*} in Figure 3²² and the convergence of MP^A and MP^N is probably not to be expected in the near future in the advanced economies let alone in the developing economies. Therefore, empirical evidence supports the conclusion that the elimination of the productivity gap and surplus labor occur at clearly different times. They do not disappear at the same turning point, T, where the wage begins to rise. Beyond T, the productivity gap remains in the absence of surplus labor. Because the labor transfer from lower-productivity agriculture to higher-productivity nonagriculture should continue after point T, the transfer of agricultural labor should not be seen solely as a phenomenon resulting from surplus labor. Therefore, Lewis's model needs to be extended to investigate labor transfer in a broader sense; the transfer of surplus labor may be viewed as the first phase in the transfer of agricultural labor.

In Lewis's 1954 paper, surplus labor is accompanied by the productivity gap as well as the constant real wage level, as Figure 3 shows. We have pointed out that the productivity gap cannot be attributed to surplus labor in general. Furthermore, surplus labor does not exclude, logically and empirically, even the possibility of rising real wages in some cases, even when surplus labor is defined by a zero marginal product.²³ To

²² Curves of both MP^A and MP^{A*} also indicate that labor productivity would grow more quickly in agriculture than in nonagriculture. The proposition that the agricultural productivity grows more quickly is assumed or predicted even in the literature of "structural change research" where no initial productivity gap between agriculture and nonagriculture is supposed to exist. See. e.g. Ngai and Pissarides (2004). They estimated that relations among the growth rates of productivity in agriculture, manufacturing and service sectors, respectively, g_A , g_M and g_S , were $g_A - g_M = 0.01$, $g_M - g_S = 0.01$ for the US economy from 1869 to 1998, that is, $g_A > g_M > g_S$.

²³ Berry (1987: 213) argued that "there is nothing inconsistent between labor surplus and a positively sloped supply curve". But he seemed to confuse surplus labor in Lewis's sense with commonly observed unemployment in the economic sense. In fact, without constancy of the real wage, Lewis's surplus labor will be almost unobservable and hence lose its empirical content. In this regard, note that

illustrate this point logically, we reproduce below in Figure 4, with slight changes, a figure created by Fei and Ranis (1964: 12). The curve OKCMZN represents the agricultural production function (Y^A) as a function of the agricultural labor force. The initial endowment of agricultural labor is OP on the horizontal axis; by assumption, the endowment of land is fixed. Obviously, the initial average product of labor in Figure 4 is $(NP/OP)=tg\alpha_P$, which can be equated with the subsistence wage. Fei and Ranis (1964: 22-27) assumed that the institutionally determined real wage in agriculture is “usually not far from caloric subsistence and related more or less to” $tg\alpha_P$ and asserted that “as long as surplus labor continues to exist in the agricultural sector (*that is, until L^A decreases to OR in Figure 4*),²⁴ there is no reason to assume” that the real wage will rise significantly from $tg\alpha_P$. Hence they referred to $tg\alpha_P$ as the “constant institutional wage” (CIW). Five

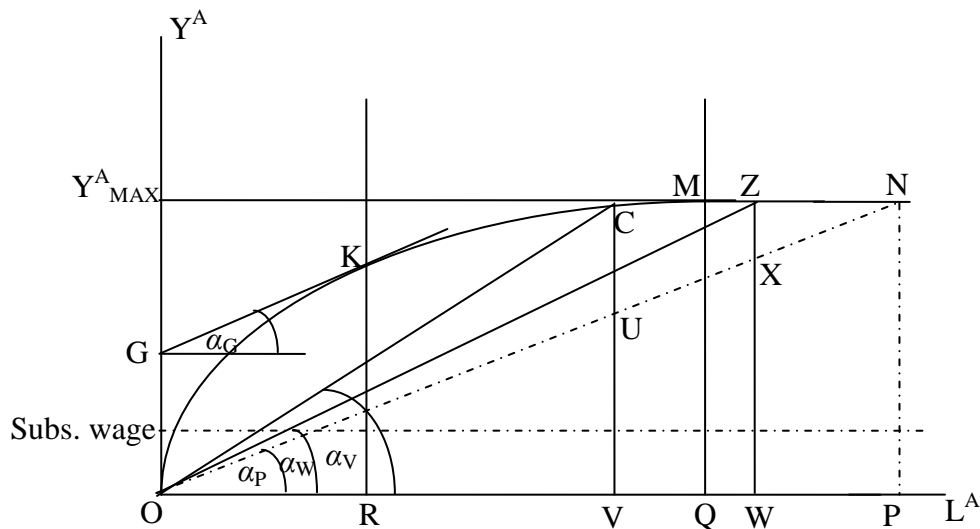


Figure 4: Surplus Labor with a Rising Wage Level

Source: Figure 1b in Fei and Ranis (1964: 12) with slight changes.

Lewis (1979: 224) viewed rises in urban wages in developing countries as “the real theoretical puzzle”.

²⁴ Italic words are added by the author of this paper.

pages later, after investigating a case where the agricultural labor is OW units, they found there exists some product surplus (shown by XZ in Figure 4) if CIW is valid.²⁵ They then asked who receives XZ: cultivators, landlords, or the government. Unfortunately, they totally neglected the possibility that landholding cultivators could claim XZ.²⁶ Evidently, as soon as that possibility is admitted, the concept of the CIW could become invalid because, with $L^A=OW$ in Figure 4, the wage level could be $(ZW/OW) = \text{tg}\alpha_w > \text{tg}\alpha_p$, implying the co-existence of surplus labor and rising real wage. Therefore, Fei and Ranis's figure demonstrates clearly the potential for the real wage to rise continuously, simultaneously with the transfer of labor from agriculture, when the cultivators receive the product surplus, whether or not there is surplus labor.

An empirical demonstration of the co-existence of surplus labor and a rising wage is the Chinese agricultural sector after 1978, when China's farmers finally secured a part of the product surplus from a government that previously had captured all agricultural product surpluses through its totalitarian administration. As Table 1 shows, in every year during 1970-78, the real wage for Chinese industrial workers was lower than its level in 1952. Because Chinese farmers were strictly prohibited from seeking jobs in nonagriculture before 1978, the constancy of the industrial real wage must point to the conclusion that the real incomes of farmers were no better than for their industrial

²⁵ In their research, Fei and Ranis emphasize this product surplus, which first enables labor to transfer from agriculture to nonagriculture, and which is overlooked by many other early development economists including Lewis.

²⁶ Based on their study of the Japanese experience, Fei and Ranis (1964) held that landlords claimed the agricultural surplus. However, there are still questions about wage constancy to clarify. Fei and Ranis pointed out that the pressures of traditional manners and customs in an agricultural community will lead landlords to grant landless farmers the subsistence wage, even when their productivity is very low. However, they did not explain why the same pressures do not induce landlords to award increasing wages to those farmers as their productivity rises with the transfer of more and more farmers from agriculture.

counterparts, although no statistical data to confirm that proposition are available.

The implication is that the CIW was valid in Chinese agriculture when the agricultural product surplus was owned exclusively by the governments (Hu, 2002). However, after China loosened controls and implemented market-oriented reform measures beginning in 1978, the Chinese farmers and industrial workers received higher and higher wages as shown in Table 2.²⁷ China's ALS was still 70% in 1978 (NBSC, 2010: Table 1-4), which points to the existence of substantial "surplus labor" in Chinese agriculture at that time. Thus rising wages and surplus labor seem not to have been mutually exclusive in China's case after 1978. Lewis's model of surplus labor with constant real wages can certainly apply to some cases, but may not be generalized to all cases of even in the early phases of economic development.

²⁷ About China's labor market after 1978 see Hope and Lau (2004).

Table 1: Industrial Real Wage and Labor Productivity in China, 1953 to 1978

Growth rates over 1952 as base year (%)

Year	Industrial Real Wage	Industrial Productivity	Year	Industrial Real Wage	Industrial Productivity
	A	B		A	B
1953	6.6	27.1	1966	2.5	292.3
1954	7.7	38.0	1967	5.0	213.7
1955	4.4	45.3	1968	3.9	177.1
1956	16.3	96.8	1969	2.5	247.9
1957	16.7	119.5	1970	-1.7	315.7
1958	-5.8	64.3	1971	-3.7	303.8
1959	-8.2	71.3	1972	-0.8	286.4
1960	-7.3	130.2	1973	-1.7	292.6
1961	-18.7	51.3	1974	-3.8	270.0
1962	-12.9	69.6	1975	-4.2	295.0
1963	-2.6	124.6	1976	-4.9	246.8
1964	2.8	180.8	1977	-7.1	276.1
1965	3.6	237.9	1978	-0.9	283.9

Source: China Statistical Yearbook (CSY)-1991, p. 63.

Table 2: Rising Wages in Agriculture and Industry in China, 1978 to 1999

Year	Real Agri. Income per Head of Agri. Residents	Industrial Real Wage	Growth Rate of Indus. Real Wage to the level in 1952	Year	Real Agri. Income per Head of Agri. Residents	Industrial Real Wage	Growth Rate of Indus. Real Wage to the level in 1952
	Year of 1985=100		%		Year of 1985=100		%
1978			-0.9	1989	89.22	111.38	43.3
1979			6.6	1990	104.70	121.63	53.1
1980			12.5	1991	103.36	126.49	
1981			10.4	1992	116.58	134.97	
1982			10.0	1993	111.19	144.55	
1983			10.1	1994	119.36	155.68	
1984			29.4	1995	129.63	161.59	
1985	100.00	100.00	35.5	1996	143.79	167.73	
1986	99.67	108.20	46.1	1997	149.09	169.58	
1987	101.17	117.94	48.7	1998	147.00	181.79	
1988	98.96	116.99	48.5	1999	142.32	200.60	

Note: Real agri. income per head of agri. residents is calculated with per head income of agricultural residents divided by the rural Consumer Price Index (CPI).

Sources: Per head income of agricultural residents: 1985, 1987 to 1991: CSY-1992, p. 307 with indicator of net agricultural income per head of agricultural residents, where agriculture contains agriculture, forestry, animal husbandry, fishery and other rural economic activities done by agricultural residents; 1986: CSY-1990, p. 313 with the same indicator; 1992 to 1994: CSY-1995, p. 279 with indicator of net income per head of agricultural residents from the primary industry; 1995 to 1997: CSY-1998, p. 345 with the same indicator as for the years from 1992 to 1994; 1998 to 1999: CSY-2000: p. 331 with the same indicator as for the years from 1992 to 1994. Rural CPI: CSY-2000, p.290. Industrial real wage: CSY-2000: p. 144 with indicator of real wage of workers in the state-owned enterprises.

4. From Labor Transfer to Transfer Speed

Although the explanatory power of Lewis's concept of surplus labor is limited for cases in which farmers own a part or all of their products,²⁸ his question of labor transfer from agriculture to nonagriculture and his dualist approach provide us with profound insights and powerful tools to investigate the process of de-agriculturalization. On the shoulders of Lewis, we are able to see farther and push the research on de-agriculturalization further. Many proposals for further research on developing countries have been advanced, for example, by Stark and Bloom (1985) labeled "new economics of labor migration"; by Stiglitz (1986; 1989) entitled "new development economics"; or by Meier (2002) and Girvan (2005) in commemoration of the 50th anniversary of the Lewis model. Most of them pay particular attention to Lewis's ideas about the interactions of economic, social, cultural and political forces in the development process. This paper takes a step forward in another direction in moving from the issue of labor transfer to ask questions about the speed of that transfer.²⁹

The speed of transfer is a natural extension of Lewis's research because the ongoing process of de-agriculturalization in many countries leads to questions about how the speed with which labor transfers affects the economic benefits that flow from moving labor from low-productivity to high-productivity sectors. Lewis and the development

²⁸ Lewis himself did not use the phrase "surplus labor" in his 1979 paper: "The Dual Economy Revisited" on the grounds that "it causes emotional distress" (1979: 461), but he stressed in his following sentence that "as always, the idea (*of surplus labor*) intended to be conveyed is that of an infinitely elastic supply of labor to the modern sector at the current wage". Italic words added by the author.

²⁹ Here we adhere more to a theme of Chenery (1992) who hoped that short-run macroeconomic analysis for the developing countries would become the frontier of development research even though such analysis still lacked theoretical foundations at the time.

economists of his time concerned themselves mainly with the preconditions for a beneficial transfer of labor, e.g. capital accumulation in nonagriculture and an agricultural product surplus. They convincingly demonstrated that agricultural labor can transfer from less to more productive activities if the preconditions exist in an economy. They established the fall of the ALS as a historical trend and investigated its theoretical feasibility, but their research largely focused on this issue.³⁰

The logical next stage of the research is to pose to questions about how the ALS falls for given preconditions. For example, *how much* both new capital and agricultural surplus product in a year are required for the efficient transfer of a given amount of labor from agriculture; or given a projected fall in the ALS during the coming year, could that change in the ALS be considered “adequate”? In economic terms, the speed of the labor transfer is usually identified as the migration rate in the development literature. The migration rate measures the amount of labor transferred from agriculture during a specified period relative to some aggregate measure of labor, e.g. as follows:³¹

$$(4.1) \quad m_{t-1,t} = \frac{M_{t-1,t}}{L_t}$$

where m and M stand for the migration rate and the quantity of labor migrated out of agriculture, respectively, while L denotes either the entire labor force (Hu, 2009), or nonagricultural labor (Mas-Collel and Razin, 1973) or agricultural labor (Mundlak, 1979).

Taking all labor as the denominator of the migration rate, Hu (2009) demonstrates that:

³⁰ Ranis (2004: 714) pointed out that “neither Lewis nor the classical school concerned themselves in detail with the analysis of intersectoral relations or the intersectoral terms of trade. Lewis’s main focus was on the reallocation of labor until the turning point is reached ... The fact that the terms of trade are a crucial determinant of intersectoral labor market, financial market and commodity market clearance is not something he very much concerned himself with.”

³¹ It is straightforward that $M_{t-1,t}$ is a flow occurring during a period defined by two time points, $t-1$ and t , while L is a stock measured at a given time, e.g. t . However, L can be an average of its measures at $t-1$ and t or other variants.

$$(4.2) \quad m_{t-1,t} \equiv \Delta \text{ALS}_{t-1,t}$$

which shows that the migration rate in a certain period is identical to the change in the ALS during the same period. Because ΔALS is the velocity of the fall in the ALS during a period, we derive its acceleration, a , in the form:

$$(4.3) \quad a_{t-1,t;t,t+1} \equiv \Delta \text{ALS}_{t,t+1} - \Delta \text{ALS}_{t-1,t}$$

where ΔALS and a will be, respectively, the instantaneous velocity and acceleration of the fall in the ALS if the period concerned becomes unlimitedly short. Both the falling velocity and acceleration are not just useful, but also indispensable to describe the process of labor transfer illustrated in Figures 1 and 2 in Section 2 of this paper. Therefore, the laws governing de-agriculturalization should also govern the velocity and acceleration of the fall in the ALS. Hence both concepts pave the way for research on how the transfers occur over time.³²

Figure 5 depicts the falling courses of the ALS in the United States and China (so far).³³ It shows that the ALS fell much faster in China than in US, but much more

³² Labor transfer and its speed are clearly of different analytical dimensions as e.g. unemployment and the unemployment rate are. Petty (1662) already discussed on utilizing public works to address unemployment. Ricardo and Marx raised concerns about endogenous unemployment created by technological changes in the capitalist economy. But the unemployment rate was essentially absent until the first half of the 20th century. In the light of modern macroeconomic analytical approaches to the unemployment rate, the unemployment notions held by earlier economists look “early and rude”, as Keynes (1936) characterized Malthus’ effective demand idea. Chenery (1983: 859) also recognized the “rather rude techniques” of development economics. Therefore, transitioning from labor transfer to the speed of its transfer, or from the migration of agricultural labor to the migration rate, could mark progress in economics as well. Krugman (1994: 40) observed that the crisis of development theories in the 1950s resulted from their inability to express themselves ‘in the kind of tightly specified models that were increasingly becoming the unique language of discourse of economic analysis’.

³³ Üngör (2011) plotted the falling curves of the agricultural employment share (AES) for the United

steadily in the US than in China. The graphs in Figure 5 have similarities with the preferred landing pattern of a passenger plane, where the axes show height and time. A

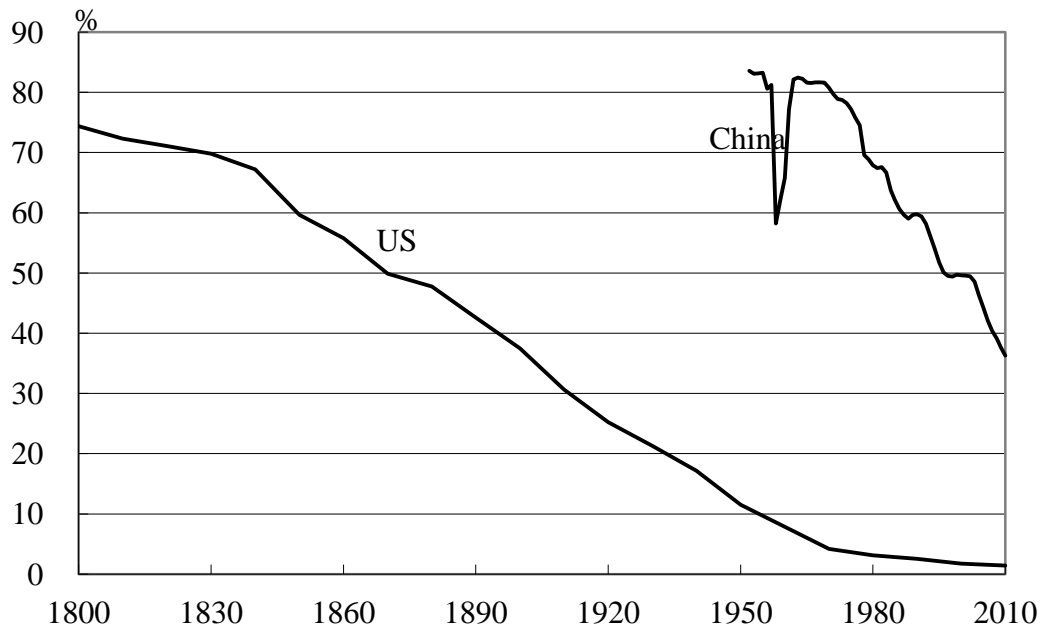


Figure 5: Falls in the ALS over time in the United States and China

Notes: US: decennial data of the census years from 1800 to 2010. China: annual data from 1952 to 2010.

Sources: China: Total and Agricultural Labor: NBSC, 2010, Table 1-4, CSY-2012, Table 4-1, 4-3. Data in CSY-2012 are preferred if data from the two sources for same years are different. US: 1800-1880: Carter, Gartner, Haines, et al., eds., 2006, Table Ba829-830; 1890-1900: Average of two data sets for the same years, *ibid*, 2006, Table Ba829-830, Ba470-472; 1910-1930: *ibid*, 2006, Ba470-472; 1940: Average of two data sets, *ibid*, 2006, Ba470-472, ERP 2012, Table B35; 1950-2010: ERP 2012, Table B35.

plane full of passengers should land as rapidly but as stably as possible. Any big disturbances during the landing might hurt and even kill people. Any big delays will increase the risks of disturbances. Information on the plane's current height or distance

States and another 22 countries in Asia, Latin America and Europe from 1963 to 2005. The trajectories of the AES-curve for each of the 22 countries seem to lie between those of the US and China shown in Figure 5. However, Üngör did not pose questions about the speed with which the AESs fall.

travelled describes what the plane has accomplished and what it still has to do for the landing, but says little about how it is faring in the landing process. The concepts of landing velocity and deceleration are essential here. The same is true also for the fall in the ALS. If we follow Lewis in regarding the fall in the ALS as a historical megatrend and thus as “positive”, then the faster and the more stable is the fall of the ALS, the better the fall will be for the well-being of humankind in the process of de-agriculturalization. Obviously, knowledge of the ALS alone is insufficient to show how the fall is proceeding and to indicate what should be done to improve performance during the ALS’s fall.

Both concepts of falling velocity and acceleration may be indispensable for studying the dynamic movements in the ALS. The velocity measures the rapidity of the ALS’ fall while the acceleration the stability or smoothness of the fall. Therefore, the greater the falling velocity and the smaller the acceleration are, the better the falling course of the ALS should be. A basket labeled “question about the speed of labor transfer” may contain sub-questions, beside others, such as:

- 1) Equilibrium instantaneous velocities of the ALS’s fall
- 2) Equilibrium instantaneous accelerations.
- 3) Optimal velocities and accelerations
- 4) Mechanisms, through which the velocities and accelerations deviate from their equilibrium and/or optimal paths.
- 5) Adequate ways, by which humans consciously affect the velocities and accelerations, particularly in certain economies and at certain times.

All of these sub-questions should be answered in a general framework of theory as well as for the special cases of different countries experiencing different stages of de-agriculturalization. It is clear that the question of the speed of labor transfer with its many sub-questions is not only of theoretical interest and historical relevance, but also of importance for the short-run macroeconomic performance and economic policy of

developing economies.³⁴ To highlight the policy implications of the question, we again take an example from China. As shown in Figure 5, China's ALS-curve experienced a severe "turbulence" around the end of the 1950s. The turbulence happened as the ALS first experienced an abrupt "free fall", then bounced back sharply and even exceeded the level that preceded the free fall. China's official statistics that document the turbulence are provided in Tables 3-5, which show that the "free fall" took place in 1958, when the net decrease in agricultural labor surpassed 38 million, that is, nearly a fifth of the total labor force engaged in agriculture, within a single year. Correspondingly, labor transferred from agriculture spiked at more than 61 million³⁵ and the yearly fall in the ALS, that is, Δ ALS, reached 23 percentage points. That would mean that China could decrease its ALS almost to zero in less than 4 years if this velocity had been sustained.

Demonstrably, the velocity

³⁴ Lewis (1986) stressed that he was an applied economist. However, in order to apply his ideas for economic policy to facilitate the transfer of labor from agriculture, one needs to know about the transfer's speed and the factors affecting it. Therefore, the issue of the transfer's speed has immediate implications for economic policy, although research on the issue might appear, at first glance, to be abstract. It is enlightening to recall Lewis's observations about the figures in the economic plans of some developing countries during the 1960s (1966: 14-15): "A statement that the output of a particular industry is expected to increase by 45 per cent during the next five years may have no significance whatsoever; or may serve merely as propaganda, intended to encourage producers in that industry to redouble their efforts. If the figure becomes the basis of policies, such as import controls, or building licenses, or subsidies, it then becomes important to know how the target of 45 per cent was chosen. Most such figures are taken out of the air, but some more solid method becomes essential if the figures are to determine policy."

³⁵ The extremely large difference of 23 (=61-38) million between the decrease in agricultural labor (Δ LA) and labor migrated out of agriculture (M) in China in 1958 needs more explanation. While $\Delta LA_{t-1,t} = LA_t - LA_{t-1}$, M can be rewritten as $M = -\Delta LA_{t-1,t} + n_{t-1,t} LA_{t-1}$. Therefore, the difference between the two measures depends mainly on n . It was n that rose to 11.90% in 1958, contributing to the unsustainably large gap between Δ LA and M in the same year. For reference, data on China's n (%) from 1953 to 1963 were: 3.06; 2.19; 2.27; 3.09; 3.27; 11.90; -1.61; -1.12; -1.12; 1.25; 2.82 (NBSC, 2010, Table 1-4).

Table 3: Speed of Labor Transfer from Agriculture in China around 1958

Year	LA	ΔLA	$g(LA)$	M	ALS	ΔALS	a
	million		%	million	%		
1956	185	-0.5	-0.26	6.2	80.6	2.70	2.83
1957	193	7.7	4.13	-1.6	81.2	-0.67	-3.37
1958	155	-38.2	-19.78	61.2	58.2	23.00	23.66
1959	163	7.8	5.04	-10.3	62.2	-3.93	-26.93
1960	170	7.5	4.58	-9.3	65.7	-3.58	0.35
1961	197	27.3	16.05	-29.2	77.2	-11.42	-7.83
1962	213	15.3	7.74	-12.8	82.1	-4.95	6.47
1963	220	6.9	3.24	-0.9	82.5	-0.34	4.61
1964	228	8.4	3.80	0.7	82.2	0.25	0.59
1965	234	6.0	2.61	1.7	81.6	0.60	0.36

Note: LA stands for agricultural labor and g for growth rate. $M=(LA_{t-1}-LA_t)+n_{t-1,t}LA_{t-1}$, where n represents the growth rate of total amount of labor (L). Also $M_{t-1,t}=\Delta ALS_{t-1,t}L_t$ according to (4.1) and (4.2). Formulas for computations of ΔALS and a see (4.2) and (4.3).

Sources: LA and L: NBSC, 2010, Table 1-4. ΔLA , $g(LA)$, M, ALS, ΔALS and a are computed by authors of this paper with data on LA and L.

was impossible to sustain, and its consequence was a disaster, with human distress and deaths on an unprecedentedly large scale. The accompanying accelerations were too large for any semblance of stability, as one reasonably would expect in a comparable situation during the landing of a passenger plane.

Figures in Table 4 offer an unambiguous picture of the dramatic fall in food availability for the Chinese people immediately after 1958. Compared to their levels in

1957, grain per capita fell from 302 kg to 207 kg in 1961; meat from 6.2 kg to 2.9 kg in 1962; and edible oil, sugar, fruits and aquatic products from 6.5 kg, 18.4 kg, 5.0 kg and 4.8 kg to 3.0 kg, 5.6 kg, 4.0 kg and 3.4 kg in 1962, respectively. Even the output of cotton

Table 4: Dramatic Fall in Agriculture Production after the Year of 1958

kg per capita

Year	Grain	Meat	Oil-Bearing Crops	Sugar	Fruits	Aquatic Products	Cotton
1956	306.8		8.1	16.4	4.9	4.2	2.3
1957	301.7	6.2	6.5	18.4	5.0	4.8	2.5
1958	299.5		7.2	23.7	5.9	4.3	3.0
1959	252.5		6.1	18.1	6.3	4.6	2.5
1960	217.3		2.9	14.9	6.0	4.6	1.6
1961	207.3		2.8	7.7	4.3	3.5	1.2
1962	229.5	2.9	3.0	5.6	4.0	3.4	1.1
1963	245.8		3.6	12.0	4.2	3.8	1.7
1964	266.0		4.8	19.1		4.0	2.4
1965	268.2	7.6	5.0	21.2	4.5	4.1	2.9

Notes: Meat includes pork, beef and mutton only. No data are available for the blank cells.

Sources: Agricultural productions: NBSC, 2010, Table 1-32; Population: *ibid*, Table 1-3. Per head agricultural products are computed by authors of this paper.

per head decreased sharply from 4.8 kg in 1957 to 3.4 kg in 1962. One should emphasize that the level of food availability in China in 1957, at best, was barely sufficient to support a so-called “subsistence lifestyle”. The dramatic fall by about a third from this already exceptionally low level inevitably resulted in a severe famine with millions of deaths as shown in the last two columns of Table 5.

The first two columns of Table 5 point to a sharp fall in overall consumption, including of nonagricultural goods and agricultural products for which data are not shown in Table 4. Taking the level in 1958 as 100, the consumption of the average Chinese fell

continuously in the three following years and, at only 81.4 in 1961, had declined by almost a fifth between 1958 and 1961. Only in 1965, seven years later, did the consumption index again surpass its level in 1958. The absolute decreases in China's population that resulted were 10 and 3.5 million in 1960 and 1961, respectively. Allowing for new births during the two years and the particularly low population growth in 1959, the death toll due to the famine probably was much larger.

Table 5: Severe Famine after 1958 ³⁶

Year	Consumption Index		Population		
	Preceding year =100	1958=100	Total	Growth	<i>g</i>
	A	B	million		%
	A	B	C	D	E
1956	105.0	95.8	628	13.6	2.22
1957	102.7	98.4	647	18.3	2.90
1958	101.6	100.0	660	13.4	2.07
1959	91.7	91.7	672	12.1	1.84
1960	94.7	86.8	662	-10.0	-1.49
1961	93.7	81.4	659	-3.5	-0.53
1962	103.7	84.4	673	14.4	2.18
1963	109.4	92.3	692	18.8	2.79
1964	105.6	97.5	705	13.3	1.92
1965	109.8	107.0	725	20.4	2.89

Note: Consumption indexes are calculated in constant price.

Sources: Column A: NBSC, 2010, Table 1-11; Column C: *ibid*, Table 1-3. Column B, D, E are computed by the author of this paper.

Worthy of note is that the famine and its record death toll occurred during a socially and environmentally peaceful period in China. There was no remarkable unrest reported,

³⁶ These are, in the same official source, data on birth, death and natural growth rates for all the years shown in Table 5. But they are clearly incompatible with the population figures depicted in the column C. We prefer the population figures for our research.

even during the most severe food-deprivation in 1960 and 1961, and no acute nation-wide natural disasters that might have substantially disrupted agricultural production in China. On the contrary, there were very powerful national and sub-national governments with ambitious plans rapidly to realize industrialization by means of mobilizing people³⁷ and transferring labor from agriculture in the shortest possible period. Therefore, the deadly high velocity and acceleration of the fall in the ALS in 1958 were a conscious action of officials who were anxious to overcome China's backwardness in the process of de-agriculturalization, but who were ignorant of the scientific limitations on the feasible speeds for transferring labor from agriculture.³⁸

Certainly, the tragedy of 1958 and the years that followed in China was an extreme event in the history of de-agriculturalization. But it reveals how little was known about the effects of the speed of labor transfer at that time, even after the publication of Lewis's 1954 paper as well as the papers of many other early development economists. Even today, more than 50 years after the tragedy, we still lack a scientific analysis of the transfer's speed. There are still events of shortage in food supplies that can be connected with the "excessive" speed of de-agriculturalization, and resulting food price increases that often lead to economy-wide inflations. Therefore, to commemorate the 60th anniversary of the publication of Lewis's groundbreaking 1954 paper, we should endeavor to advance Lewis's research a stage further to deepen our understanding of the

³⁷ This is expressed particularly in the sudden increase of 3.5 percentage points in China's participation rate of labor in 1958 (NBSC, 2010, Table 1-3, 1-4). But the rate and the total amount of labor fell again in following years, see also footnote 35.

³⁸ Clark (1976: 239) believed that the tragedy would be a result of "misinformation about agricultural labor requirements and hysterically falsified statistics" because that information and those statistics led China's leaders to believe that agricultural production could be doubled within a year and there would be a one-third man-power surplus in rural areas that could be transferred out for industrialization "immediately" (ibid). For an analysis of the famine see Lin and Yang (2000) and Sen (1999).

human experience with de-agriculturalization and to refine the tools for policy making to benefit those people living in many developing countries in which the transfer of labor from agriculture is proceeding now and for an indefinite future.

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