6

Structural Transformation

6.1. Introduction

The literature on economic growth, to which we were introduced in Chapters 3–5, might lull you into thinking of development (or growth at least) as a process that transforms all sectors of the economy in a balanced fashion. The very idea of "aggregate output" implicitly downplays the importance of structural or compositional change across economic sectors. This view might serve us reasonably well when just a broad-brush overall assessment is needed. But as soon as we are interested in the *distribution* of income or growth across sectors or people, it is hard to escape the reality of structural change, the sector-based nature of development and the questions that sectoral transformations pose.

Structural change is fundamentally uneven. First one sector (or production method), then another, then a third, grows rapidly, *but not all together*. Visualize the growing dominance of industry over agriculture, of services over manufacturing, the information technology revolution, or the dramatic changes to be wrought by artificial intelligence. At a more granular level, think of the rise of new services such as call centers or diagnostic services, the automation of standard tasks, new monitoring and enforcement technologies, or vehicles for financial transactions. All these changes lead initially to unbalanced income creation, followed by a compensatory process that attempts to spread the returns more widely across the population.

This chapter is a central connector. It links back to our discussion in Chapter 4.5.3 on questions of divergence and convergence within and across sectors. But this chapter also links forward to our coming discussions on economic inequality *within* countries, and to the work of Simon Kuznets (1955, 1963) and others. As we shall see, the idea of development as structural change, accompanied by a cacophony of disequalizing changes followed by compensating changes, is a useful one. These waves of change could interact and overlap to create complicated patterns of inequality and growth overall. Such a viewpoint begins to bridge the gap between the macro and the micro of development economics. In particular, it begins to pick at the aggregative structure of growth theory, and points to the areas of dualism, inequality, and the ever-changing nature of occupational choice as central features of economic development.

6.2. Structural Transformation: An Overview

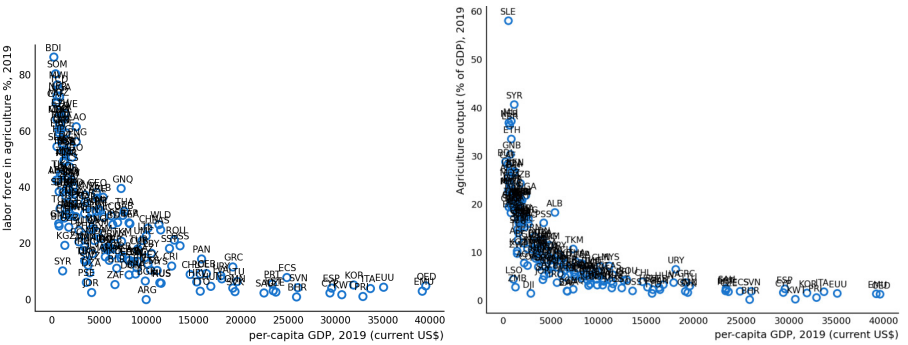
By the term *structural transformation*, we mean a process that entails a systematic shift in the economic importance of one sector relative to another. The choice of sectors depends on our focus and the questions we wish to ask. If we define those sectors very narrowly, then mini-structural transformations corresponding to those fine-grained definitions are happening all the time. Each creates its own inequalities, as some lucky individuals experience an upsurge in their fortunes. That inequality then serves as an impetus to reallocation, as others (or their progeny) in the "lagging" sectors attempt to relocate to the growing sector. At the end of the day, uneven development can be viewed as an aggregation of all such transformations.

If we define sectors very broadly, several of these granular mini-transformations are smoothed out. That's fortunate from our academic perspective, otherwise there would be no value at all to the aggregative models of economic growth that we've already seen. However, some transformations are so broad and so powerful that we must sit up and take notice, even from the blurry heights of a fully macroeconomic viewpoint.

6.2.1. Sources of Transformation. What drives structural transformation? There are, broadly speaking, four sources of change.

The first is technology. This is both an inexorable phenomenon and an uncertain one. There's no telling what the creative human mind will come up with, so the precise location of the next innovative shock is always unknown to some degree. Sectoral transitions in history have been driven by immense technical advances — the steam engine, electricity, the telegraph. The IT revolution happened because the computer came into everyday life at a pace and at a scale that was hard to imagine before it happened. Computer cryptography, pattern recognition, and large language models have affected modern life to an unprecedented degree. Indeed, they have affected the economic advantage of meeting the *same* needs in different ways. (As a trite example, just think of various ways in which you can meet the need to travel, ranging from a bullock cart to a private jet.) A whole host of modern transformations — service industries, the revolution in decentralized finance, highly data-intensive biotechnology and health sectors, massive online platforms for social interaction, and the ongoing and deeply transformative rise of AI — can be thought of as new expressions of the same old preferences: for communication, or information, or companionship, or exchange.

The second is shifting patterns of trade, such as those brought about by globalization. This source of change might not impact the world as a whole (that would depend on the global composition of demand), but can have a profound effect on individual countries. Chief among these is a sudden opening-up to trade — a "trade liberalization" — which can bring about massive transfers of labor and resources from a traditional sector to an export-oriented sector. Just which sector that would be would depend on the pattern of liberalization and the characteristics of the country at hand. It could even be an *agrarian* boom, if the country in question has a comparative advantage in the export of certain agricultural products, or access to previously unused land. But the ones that we have all read about typically pertain to exports of intermediate or final goods at different points on the technological ladder (ranging from garments to machine tools to software to chips) and even service-based items (call centers, medical diagnostics, typesetting, and financial products).



(a) Labor Share in Agriculture **(b)** Output Share in Agriculture

Figure 6.1. The Agrarian Structural Transformation. Source: *World Bank Database.*

The third is human preferences. Technology alone cannot explain why certain transformations are predictably directional. It is *possible*, for instance, for a country to expand its agricultural sector relative to industry, but it is a safe bet to assert that the share of the labor force in agriculture, or the share of agrarian output in GDP, generally declines as a country gets richer. (Figure 6.1 shows this over a cross-section of countries.) There is a reason for this: human preferences generally move "left to right" over a scale of goods and services as we get richer. As consumers, we start off with the basics — food, clothing and shelter — and as our incomes grow, other needs (or maybe even the same needs, but let's leave that out for now) are met with other goods — typically manufactured goods, such as a bicycle or a car, a television set or a computer, a washing machine or a music system, and so on. Then there are all sorts of services: financial transactions, travel by train or air, eating out, and so on. Demand patterns stem from a complex combination of preferences and individual endowments. So it is not at all surprising to find economic development is generally marked by sectoral changes that mirror these natural shifts over the "preference map".

The fourth is institutions. All countries, developing or not, invariably have a "formal" and an "informal" sector. Formal sector firms operate under an institutional umbrella of rules and regulations, but they also have access to benefits that their informal counterparts lack, from infrastructural facilities to foreign exchange quotas to access to bank credit. In contrast, the *informal sector* is a loose amalgam of (usually small-scale) businesses or individuals that escape the cover of many of these regulations and do not receive access to privileged facilities.

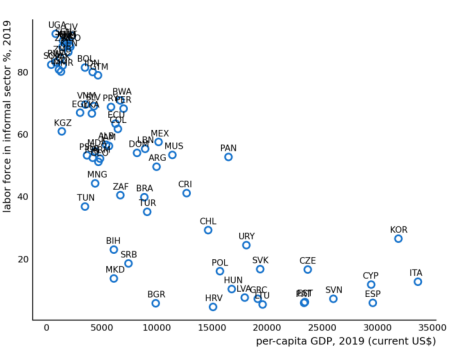


Figure 6.2. Labor Shares in the Informal Sector.

As more and more firms enter the formal sector, an important structural transformation gets under way, based on institutional accommodation. This informal-formal

transition involves a change in government capacity, such as the ability to monitor, or audit, or enforce legal contracts. Likewise, formalization entails a shift in firm organization, a willingness to submit to a codified rule of law (perhaps replacing a social norm), and an entirely different set of educational qualifications. Figure 6.10 shows how the share of labor in the informal sector declines over the country cross-section as per-capita income climbs.

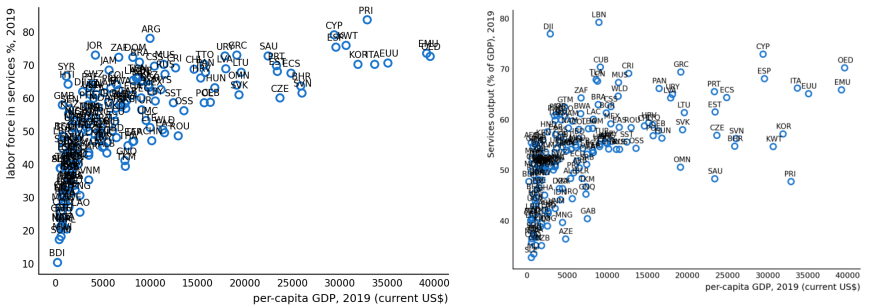
6.2.2. The Road Ahead. The focus of this chapter is on how an economy reacts to structural change by reallocating its labor across sectors. Section 6.3 sets the stage by describing a core model of sectoral change. It is based on just two sectors, one of which is pulled to expand by the forces of technology or capital accumulation or by an export boom. Our focus here is very simple: it is only to teach ourselves how labor demands in the two sectors act to form an allocative equilibrium, which then keeps shifting as the transformation proceeds. Sections 6.4-6.6 introduce two different theories of adjustment. Both build on the same core. The first is the celebrated model of W. Arthur Lewis (1954): that of "economic development with unlimited supplies of labor" — we'll have more to say about that cryptic phrase when we get there. The second examines a contrasting view: that of uneven growth followed by compensatory changes, due to Simon Kuznets (1955, 1963). Under both views, the engines of transformation — technology, or export, or some other source of change — could well be the same. But the ways in which labor allocations *react* to that change are different.

Section 6.7 hones in particularly on the agriculture-industry transformation, which is perhaps the greatest structural transformation of them all. "Agriculture → industry" engaged the great development economists of the 20th century — Arthur Lewis, Colin Clark, Simon Kuznets, Ragnar Nurkse, Albert Hirschman, Gunnar Myrdal, Paul Rosenstein-Rodan, and many others. To them, active long before the IT revolution, this was the *one and only* structural transformation.[62] See Figure 6.1 for a quick cross-sectional summary of how labor shares in agriculture diminish as income rises.

At its heart, the agrarian transformation relies fundamentally on the third source of structural change highlighted in the previous section: human preferences. Food is a basic need, and for the poor (and even the historically non-poor) it occupies a large share of the budget. That is naturally reflected in the dominance of agrarian production in poorer countries. But basic needs do not grow proportionately with income, and so the share of food in our budget declines as we get richer. This is a particular expression of what economists call *non-homothetic* preferences, under which the composition of demand for different goods changes as our income increases, holding fixed the prices of those goods.[63] So it comes as no surprise that in poor countries, agriculture occupies a dominant way of life, while in richer countries, it doesn't. Goods and services other

[62] Economists and economic historians have continued to study the agrarian structural transformation, both for the compositional insights that it brings, and also to reconcile such change with the observed stability of certain macroeconomic aggregates. See Caselli and Coleman (2001), Kongsamut, Rebelo, and Xie (2001), Herrendorf, Rogerson, and Valentinyi (2014), Comin, Lashkari, and Mestieri (2021), Fan, Peters, and Zilibotti (2023) and Gollin and Kaboski (2023).

[63] Non-homothetic preferences are defined by the negation of a common term found in textbooks: *homothetic preferences*. These refer to the assumption that an individual's consumption shares of different products are unaffected by her income, provided that the relative prices of those products are unchanged in the comparison. That is, an increase in income at a given set of relative prices is always matched by a equiproportionate rise in the quantity demanded for every good. Homothetic demand is a convenient myth, and it's useful for teaching the basics of consumer theory. But it doesn't take us very far. The fact of the



(a) Labor Share **(b)** Output Share

Figure 6.3. Labor and Output Shares in Services. Source: *World Development Indicators.*

than food begin to engage the attention of their citizens. Individuals move from rural to urban areas — or the rural areas themselves transform — to produce these goods and services, and the share of agrarian output in national income declines.

The agrarian sector is unique in that it not only acts as a supplier of labor to non-agrarian activities, *it must also produce an agrarian surplus to feed non-agrarian workers*. These twin flows must move roughly in tandem as the agrarian transformation proceeds. Of course, in a globalized world, the twin flows do not need to be in perfect balance *within* every country. Some countries could become relatively specialized in agriculture, while others could fully transform, with international trade in foodgrain taking care of domestic imbalances. And indeed, there is substantial international trade in food, with some countries engaged in large amounts of food exports and imports (or both, as in the case of the United States). But there is also enough fear of global disruptions of the supply chain (wars, natural disasters), enough desire for self-sufficiency, and enough jingoistic reliance on home production, that the "closed economy" setting — and the resulting need for *domestic* balance in the twin flows — remains extremely relevant. All of this will be taken up in Section 6.7.

Some of these arguments, particularly those pertaining to the non-homotheticity of preferences, apply well to other structural changes. Chief among these is the rise of the service sector. As we grow richer, all sorts of service industries become salient: financial (we bank and invest), retail (we trade) legal (we contract), medical (we get sick), cultural (we travel, or want to be entertained). So it is not surprising that the share of services typically tends to rise in the consumption budget as income grows, and empirical estimates of preferences support this commonsensical judgement; (see, e.g., Comin, Lashkari and Mestieri 2021 and Fan, Peters and Zilibotti 2023), though the effect here is perhaps not as clear-cut as in the case of non-food vs food items.

Section 6.9 takes up formal-informal transformations, with a twist, because it also pertains to the services sector. Think of the many informal occupations that we might see around us, and that we would classify as part of the services sector: the hawker, the cobbler, the odd-jobs kid, the trader, the retailer in a family-run shop, the delivery

matter is that one can rest an entire theory of economic development on the satisfaction of new needs for new goods, as incomes rise.

person. Yes, these are genuinely services too, but they are also *informal* occupations, and are often second-best homes for those who did not acquire a job in the formal manufacturing sector. The vast migration from countryside to city often results in such spillovers. These swell the services count in developing countries.

Overall, the first two of these forces are likely to dominate the third. Figure 6.3 depicts this for both the share of GDP accruing to services (Panel a) and the share of the labor force absorbed in the services sector (Panel b). Both these shares decidedly climb with per-capita income, though some comparative eyeballing with Figure 6.1 will immediately convince you that the relationship is nowhere as sharp as it is for agriculture. There are many developing countries that have a large percentage of labor employed in services, and even a large share of output produced there. In evaluating and understanding these seeming anomalies, we must not lose sight of the third force described above. "Services" can equally be a response to a crisis of formal employment, along with its more healthy role as an indicator of economic development.

Bolivia's Informal Sector

As in all developing countries, informal economic activity in Bolivia is deeply embedded into its society.[a] In the late 1980s, nearly half of all workers were in agriculture, industry accounted for another 20% and the rest went to services. The agrarian share declined to around a quarter by 2020, but the industrial share of employment remains largely unchanged, remaining at just above 20% in 2023 (International Labor Organization). As we noted in Chapter 2 and will see again in this Chapter, the rapid growth of the services sector in developing countries is often an indicator that the agricultural sector is releasing labor faster than the industrial sector can soak it up. Bolivia is no exception. The services sector has grown steadily (and mainly at the expense of agriculture) since 1950, but much of this growth has occurred in the informal domain, where labor is absorbed not because of demand, but due to the inability of the formal sector to provide adequate employment. Informal employment as a share of non-agricultural employment is well above 80%, and output from this sector appears to account for well over half of GDP (see, e.g., Medina and Schneider 2018).

Bolivia's informal sector includes traders, unpaid family workers, domestic help, and owner-operators of tiny work establishments, often with five or fewer workers. Informal occupations include street vending, family grocery stores, unlicensed buses or taxis, market retail, domestic help, and low-wage personal services. A significant illegal component is tied to the coca economy, which plays an unmeasured but important role. These sorts of informal activities are widespread and pervasive across all of urban Bolivia.

Income variation within the informal sector is high. While some market vendors and shop owners might earn several multiples of the minimum wage, domestic workers or informal laborers often earn less than 50% of that minimum. Women are overrepresented in the lowest-paid categories, including household help and food vending.

While Bolivia has a tradition of strong unionization — especially in mining and the public sector — these protections do not extend to the informal workforce. Regulatory burdens and labor market rigidities (such as high severance costs) may discourage formal hiring, leading to persistent dualism. Viewed through the lens of structural transformation, Bolivia's informal sector has not emerged from any endogenous rise in

services demand or sectoral productivity. Rather, it has developed as a contingent, often involuntary, spillover from urban migration and the limits of formal sector expansion.

[a] Some of the descriptive material in this box is taken from a country study of Bolivia published in 1991 by the Federal Research Division, U.S. Library of Congress.

6.3. A Core Framework for Structural Transformation

We will now outline a core model of economic development based on structural transformation. This is our first move away from the black-boxed aggregation of growth theory, thinking of economic development as the transformation of one cluster of sectors (agriculture, manufacturing, domestic production, physical technologies) into another (manufacturing, services, exports, digital technologies). I will use the index a for one sector and m for the other to remind you that the agriculture-manufacturing transformation is a leading example, but more generally we could use the mnemonic "archaic" and "modern." The former might refer to sectors that use older, simpler, labor-intensive techniques of production, or are based on family as opposed to wage labor (Georgescu-Roegen 1960, Chayanov 1966). Then the latter would refer to sectors that use new technology, or methods of production organized on capitalist principles, relying predominantly on the use of wage labor and carried out for economic profit.

Distinctions such as the above are often summarized by the idea of a *dual economy*.[64] In a sentence, dualism is the coexistence of "traditional" and "modern," where these words can have several shades of meaning, as described above. But it's not just technique or organization, or even archaic vs modern. The two sectors could produce different products, with one sector taking care of basic needs and the other sector catering to higher-end goods. The agriculture-manufacturing distinction is, of course, the central example for this case.

6.3.1. The Two-Sector Setting. Visualize, then, two sectors labeled "archaic" (a) and "modern" (m). Think of archaic labor L_a and modern labor L_m as coming from a common pool of L people, so that:

$$L_a(t) + L_m(t) \leqslant L.$$

Just as in the aggregative growth model, we have a production function, but this time there's one for each sector, producing outputs Y_a and Y_m using capital and labor. For instance, each production function might take the familiar Cobb-Douglas form:

$$Y_a = AK_a^{\alpha} L_a^{1-\alpha}, \tag{6.1}$$

where K_a is archaic capital (or land), L_a is archaic (or peasant) labor, A is TFP, and $0 < \alpha < 1$ is the relative importance of capital. Likewise, in the modern sector,

$$Y_m = MK_m^{\mu} L_m^{1-\mu}, \tag{6.2}$$

where K_m is modern capital (or machines), L_m is modern (or manufacturing) labor, M measures TFP, and $0 < \mu < 1$ is the relative importance of the capital input.

Some interesting questions arise even at this early stage. We know that L_a and L_m come from the same potential pool L, but does this mean that L_a can be easily transformed into L_m? The answer is yes in some settings, no in others. For instance,

[64] See Nurkse (1953), Lewis (1954), Jorgenson (1961), Ranis and Fei (1961), Sen (1966), Dixit (1970), Amano (1980), Rakshit (1982), and Eswaran and Kotwal (1994), among many others.

in the agriculture-manufacturing interpretation, it may be that both sectors feed off unskilled labor, the one on the farm and the other on the assembly line. Then it's relatively easy to convert one type of labor into the other: all they need to do is migrate. But if the modern sector requires a different set of skills from its archaic counterpart, then the conversion from L_a to L_m will require investments in human capital and is not automatic. Below, we study both these possibilities.

A parallel question concerns the transformation of one kind of *capital* into the other. As it turns out, the answer to this question is not terribly important to the sort of observations we want to model. So we save space and cut down on the number of possible cases by presuming that capital is specific to each sector — think of land (K_a) as opposed to machines (K_m). As an intrepid budding researcher, you can always work out the accompanying variations when the sector-specificity of capital is dropped.

6.3.2. Labor Demand and Wages. Each sector will have its own demands for labor, depending on prices and wages and its sector-specific endowment of capital. We denote the m-sector output price by p_m, and the wages in each sector by w_a and w_m. We normalize the output price of the a-sector to 1, and so think of the other prices as all expressed in units of the a-good. Assuming that producers in the m-sector are profit-maximizing capitalists, they will seek to choose L_m to maximize

$$pY_m - w_m L_m \tag{6.3}$$

where Y_m is produced from an equation such as (6.2), and K_m is the given capital endowment of the modern sector at any date.[65]

The resulting demand for labor is shown in Figure 6.4. It is easy to see from (6.3) that that labor demand will depend on the *ratio* of wages to output prices. The demand curve is downward-sloping in wages: the lower is w_m, the higher is the demand for labor in that sector. Likewise, demand increases with output prices. Demand also depends on the productivity of the sector as a whole; for instance, as the TFP term M in equation (6.2) rises, so will the demand for labor. Finally, when TFP, wages and prices remain constant, and there is constant returns to scale in production, modern employment expands in proportion to modern capital K_m, as the Appendix formally shows with the help of equations (6.2) and (6.3).

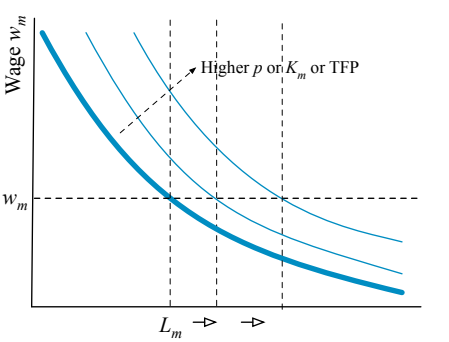


Figure 6.4. Labor Demand.

An analogous demand curve for labor exists in the archaic sector if that sector is also governed by capitalist or profit-maximizing principles. Now the relevant wage is w_a, which is expressed relative to the price of the archaic output. Just replace w_m and L_m in Figure 6.4 by w_a and L_a. But it is also possible that the archaic sector is organized differently, not along capitalist lines, and market wages as we understand them are differently (and only implicitly) defined. For instance, if all families in the

[65] Profits as defined here include returns to capital. For ease of exposition, we have suppressed an explicit description of the capital rental market, but that is easily accommodated.

archaic sector simply share their output, then there is no demand for labor as such. Rather, L_a is what it is, and a wage (or average income) is then defined by the *average* product of the agrarian production function. The following formula illustrates this for the case of the Cobb-Douglas production technology in (6.1):

$$w_a = \frac{Y_a}{L_a} = AK_a^{\alpha} L_a^{-\alpha}. \tag{6.4}$$

This takes the place of the labor demand curve. Instead of finding demand for each wage, equation (6.4) performs the "inverse exercise" finding the wages implicitly generated by each pre-given amount of labor in the archaic sector. The box on Surplus Labor in Section 6.4 returns briefly to this theme, as does the Problem Set.

6.3.3. Work Subsistence. Running through our discussion is the notion of a *work subsistence*. If a person is actively working, she must be paid at least a minimum amount z in units of the a-good. This is a payment *over and above what's needed for mere survival.*[66] Individuals who consume below the work subsistence are incapable of sustained employment. They may do odd jobs, or work sporadically, or live off other family members who do manage to work. We avoid discussing those complications here, and simply regard "survival subsistence" (as opposed to work subsistence) as zero. Section 6.7.4 has more to say on the distinction between work and survival subsistence.

Take note of three other important points. First, the work subsistence is defined by consumption defined in units of the traditional good. If all sectoral goods are the same, that's fine. If the goods are different, then the idea is that the archaic sector is the one that produces the basic consumption goods, such as food. Second, the economy can only absorb the entire labor force L if they can generate enough of a demand for labor at wage rates that aren't below the work subsistence. Third, if wages strictly exceed the work subsistence, it *must* be that there is full employment of all labor. That makes sense. In the presence of unemployment with wages strictly higher than work subsistence, wages must be bid down to the minimum that permits work.

6.4. Structural Change with Unlimited Supplies of Labor

The title of this section echoes the title of W. Arthur Lewis's landmark contribution to development economics, written in 1954. According to Lewis, an "unlimited supply of labor" was "obviously the relevant assumption for the economies of Egypt, of India, or of Jamaica …" While typical of agriculture, in Lewis's view, the phenomenon applied to "the whole range of casual jobs—the workers on the docks, the young men who rush forward asking to carry your bag as you appear, the jobbing gardener, and the like. These occupations usually have a multiple of the number they need, each of them earning very small sums from occasional employment; frequently their number could be halved without reducing output in this sector."

6.4.1. Translating Lewis into our Two-Sector Framework. Think of a large pool of potential labor, large enough so that labor demand cannot absorb that pool, with wages driven down to work subsistence. To be very specific, consider an open economy in which the outputs of the two sectors can be freely traded on the world market, so that from the perspective of our economy, the relative price p is fixed. Suppose moreover that labor can freely move between the two sectors a and m, so that w_a must

[66] In Chapter 13 we extend the connection between different consumption levels and work capacity.

always be equal to w_m.[67] Denote that common wage by w. For any such w, and for given values of K_a, K_m, p and other parameters of production, we have demands for archaic and modern labor as in Figure 6.4.[68] Add up the two: $L_a + L_m$ (that was easy!). If the total is smaller than the total labor force L, wages will fall all the way down to work subsistence, as an excess supply of labor clamors for jobs. If there's still a pool of unemployed labor, wages cannot fall any further; see Figure 6.5. The horizontal axis shows the total amount of labor L in the economy. The vertical axes show the (common) wage w. The downward-sloping curve on the left side is the demand for modern labor. The "reverse downward-sloping" curve on the right, read from right to left, is the demand for archaic labor. These demands are low enough so that wages have fallen to work subsistence z. This is an abstract depiction of a poor economy which has low capital relative to labor, and so is unable to hire its entire labor force.

In passing, let's quickly contrast this state of affairs with the growth models in Chapters 3–5. There, all labor was employed; why? The answer is that we did not pay any attention to questions of work subsistence. We presumed that all workers could work freely at *any* wage. Here, we are taking seriously the idea that a healthy work life requires a minimum standard of living. That generates the difference between the two models. You might ask: why assume one thing in one model and another in the other? The answer is that economic theory often works that way: by its use of provisional assumptions, it highlights aspects of the situation we wish to emphasize. The Solow growth model has useful insights which can be appreciated without the complications of minimum subsistence. In contrast, we are now studying a model where such considerations could occupy center stage.

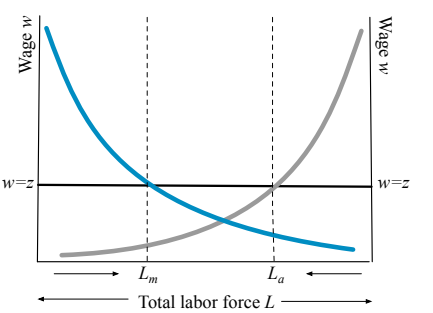


Figure 6.5. Open-economy unemployment.

Structural transformation in the open economy proceeds in a relatively simple manner. As K_m expands, the demand for manufacturing labor will shift outwards — as depicted by the dashed lines in Figure 6.6. Manufacturing employment will expand, as shown by the employment levels, $L_m^1, L_m^2, L_m^3 \ldots$. Initially, it does so without any upward pressure on the wage rate $w = z$ or on agrarian employment, which remains steady at $L_a = L_a^{1\text{-}2\text{-}3}$. This is the phase in honor of which W. Arthur Lewis (1954) coined his memorable phrase: *economic development with unlimited supplies of labor*. In this "Lewis phase", the process of structural transformation continues with no upward pressure on the wage. That wage has been driven — by labor competition — to the number that just about permits the purchase of work subsistence, and the modern sector can therefore expand with no brake imposed by a rise in labor costs. And so it was that Lewis concentrated his entire perspective on just one goal:

[67] We neglect here the costs of migration, which are easily incorporated. But see Section 6.5 for a different take on $w_a \neq w_m$.

[68] This is whenever both sectors are capitalistic. Otherwise, if the archaic sector is described by output-sharing as in equation (6.4), start with any L_a in the archaic sector, read off the average product it generates, call that w, and then take note of the demand L_m.

> "The central problem in the theory of economic development is to understand the process by which a community which was previously investing and saving 4 or 5 per cent of its national income or less, converts itself into an economy where voluntary saving is running at about 12 to 15 per cent of national income or more."

6.4.2. Capital Accumulation. That quote sounds like Harrod or Domar could have written it — recall how the savings rate in their theory affects the growth rate of the economy, in contrast with the Solow model (where it only affects the steady state level). And indeed, as long as we are in the Lewis phase, there is an interesting connection to Harrod-Domar. Substitute the profit-maximizing choice of labor in equation (6.3), and use any constant-returns scale production for $Y_m = F(K_m, L_m)$ to obtain an expression for manufacturing profits:

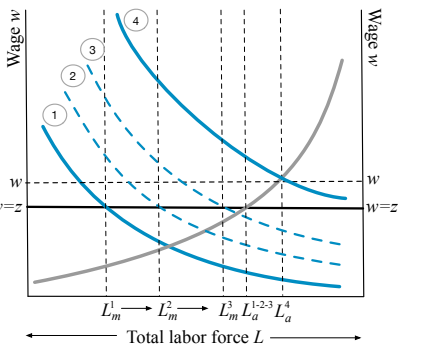


Figure 6.6. Capital accumulation ($K_m \uparrow$).

$$\text{Manufacturing Profits} = pY_m - wL_m = pF(K_m, L_m) - wL_m = BK_m, \qquad (6.5)$$

where B depends on the price p, the wage w, and parameters governing the production function F (including TFP). It *multiplies* K_m, so that overall profits move linearly or proportionately with K_m *as long as none of the aforementioned parameters move with capital accumulation*. This is a property of any constant-returns-to-scale production function: as K_m accumulates but with no change in prices, wages and other technical parameters, optimal production and labor use — and therefore manufacturing profits — all scale up in the same proportion. The Appendix contains a derivation of this property for the Cobb-Douglas production function.

We tie the expression in equation (6.5) to capital accumulation by assuming that all wage payments are consumed, while a fraction s of the profits produced in manufacturing is plowed back into modern capital accumulation. Doing so, we obtain a capital accumulation equation which looks just like the one in Chapter 3:

$$K_m(t+1) = (1-\delta)K_m(t) + s\,\text{Profits} = (1-\delta)K_m(t) + sBK_m(t), \qquad (6.6)$$

where we index by time t as we did before in Chapter 3. As noted, B is unchanging as K_m expands in the Lewis phase, because (among other things) this expansion has no effect on the wage rate. So our modern sector grows exactly as in the Harrod-Domar model, with modern capital and output growing at a constant rate over time.

This process must continue for a while. The finiteness of the overall labor force L cannot register itself until all unemployment has been soaked up, the real wage starts to rise, and agrarian employment starts to fall. Figure 6.6 illustrates this with the rightmost modern demand line, which is high enough to absorb all of L in conjunction with archaic demand, so that L_a now shrinks to L_a^4. The corresponding wage rate now rises above z, and the exponential rate of growth must slow down. The beginning of this move is what Ranis and Fei (1961) called a *turning point* in structural transformation, after which labor becomes a scarce commodity, and intersectoral change begins to

slow down. That marks the end of the Lewis phase of economic development. In the several Sections to come, we will encounter other perspectives that both enrich or depart from this summary — but different perspectives are what this book is all about.

Surplus Labor

"Economic development with unlimited supplies of labor" — Arthur Lewis's phrase was provocative enough to instigate a flood of research on surplus labor in agriculture. His assertion that "there are large sectors of the economy where the marginal productivity of labour is negligible, zero, or even negative" hinted at a free resource: labor.

But wait a minute: if the marginal product of labor is close to zero, how is it that such labor is hired, unless wages themselves are close to zero as well? One simple answer, based on our notion of work subsistence which necessarily creates a floor to wages, is that all labor is *not* hired. That corresponds to the situation in Figure 6.5, in which unemployed labor exists, and is pulled out by capital accumulation in the modern sector.

A complementary possibility: agriculture is organized differently, an observation we introduced at the end of Section 6.3.2. A profit-maximizing firm regards wages as a cost, to be subtracted from revenues order to arrive at profit. In contrast, a family farm values the incomes received by each of its members, and so might employ labor *beyond* the point where its marginal product equals wages. Indeed, the "wage" in this case is not really a wage at all, but the average output of the farm. Figure 6.7 depicts production as a function of labor (for fixed capital and/or land). Average product is output Y_a divided by labor input L_a, and is represented by the angle marked "average product" (see equation (6.4) for a formula). Contrast this with the *marginal* product, which is the slope of the flattish tangent to the production function at the point (L_a, Y_a). Sharing rules such as these shelter family members from the difficulties of finding employment.

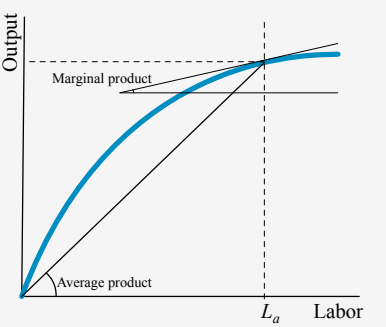


Figure 6.7. Output Sharing.

Income sharing is not just an agricultural phenomenon and occurs not just among families. It is not uncommon to see this in the urban informal sector as well. Thus the neighborhood store may be run by a joint family, with revenues divided among siblings. A cab driver might share his driving with a friend. The bus conductor of a crowded bus might sublease part of his ticket-collecting duties to a nephew. The phenomenon could even spill over to commercial enterprises, as Lewis observed:

> Most businesses in underdeveloped countries employ a large number of "messengers," whose contribution is almost negligible; you see them sitting outside office doors, or hanging around in the courtyard. And even in the severest slump the agricultural or commercial employer is expected to keep his labour force somehow or other — it would be immoral to turn them out, for how would they eat, in countries where the only form of unemployment assistance is the charity of relatives? So it comes about that even in the sectors where people are working for wages, and above all the domestic sector, marginal productivity may be negligible or even zero.

Lewis was not alone in asserting the existence of surplus labor. Already in the 1940s there were claims that large numbers of able-bodied people were in surplus in the agricultural sectors of eastern and southeastern Europe and in the Soviet Union. Rosenstein-Rodan (1943) and Nurkse (1953) were among those who held this view. These writers realized that the presence of redundant labor in the agricultural sector meant that the population surplus could be transferred out of the agricultural sector with no loss in agricultural output. Surplus labor is, therefore, a supply of labor that, given the preponderance of the agricultural sector in less developed economies, is likely to be of major quantitative importance in the development process of less developed economies. This is the classical tradition that Lewis inherited. It started off a fascinating but largely academic debate about whether the marginal product of labor was *really* zero or just low.[a]

The really important question is whether agriculture serves as an infinitely elastic supplier of labor in the early stages of the structural transformation. As we have seen in Section 6.4, the answer could well be yes. But as we shall see in Sections 6.5 and 6.7 to follow, other considerations could serve as impediments to the development of industry. The free availability of labor in agriculture does not imply its costless use elsewhere.

[a] Viner (1957) and Schultz (1964) were notable opponents of the zero-marginal-product view. In particular, Schultz (1964) argued that the influenza pandemic in India (1918-19) led to a significant drop in output. See the subsequent contributions to this debate by Sen (1967) and Takagi (1978).

6.5. Structural Change with Skill-Based Wage Differentials

The Lewis model of economic development refers to an "unlimited supply of labor," in the sense that workers can be drawn from the archaic sector into a modern sector at a constant wage, least up until the Lewis turning point where unemployment vanishes. But an abundance of labor in the archaic sector does not translate into a corresponding *immediate* abundance in the modern sector. Simon Kuznets (1955, 1963) emphasized a different scenario in which the labor supply to the modern sector is limited, at least in the short run. This limitation isn't due to an absolute scarcity of workers, but the use of different skill sets in the two sectors or lack of adequate information about job opportunities. As a result, even though intersectoral migration could still occur in the longer-run, that movement occurs as a gradual result of skill or information acquisition. In particular, the wage rate in the m-sector is not constant: it shoots up initially, and only gradually adjusts as more workers acquire the necessary attributes to enter.

Lest you think that all this pertains to the agriculture-industry transformation and no more, look no further than the salary deals being offered to AI engineers, right now in 2025 as I write. There is a significant first-mover advantage for those joining the modern sector early — whatever "modern sector" might mean, as long as new skills or information are needed to enter that sector (see, for instance, the box on Bangladesh's export-led structural transformation). The Kuznets view of transformation relies on disequalizing, uneven initial changes, followed by equalizing, compensatory changes. The reallocation of labor across sectors is accompanied by differential wages, rising inequality in the short to medium run, and eventual convergence as broader access to education and training expands the effective labor supply for the modern sector. By that time, of course, the modern sector may have switched identities, starting off a new Kuznets cycle.

6.5.1. Uneven Change. Consider a two-sector economy: an archaic sector (e.g., agriculture or informal services) and a modern sector (e.g., manufacturing or high-tech services). The modern sector is expanding due to demand growth or technical progress, and therefore needs more labor. In the Lewis model, workers in the archaic sector would move immediately and seamlessly into the modern sector. Under the Kuznetsian view, the initial supply of modern labor is inelastic, either due to skills or limited information. This scarcity drives up the wage in the modern sector, which now reflects both the marginal product of labor and a scarcity premium. The wage differential between the two sectors opens up and persists until a compensating supply response occurs. Figure 6.8 illustrates. Starting from an initial equilibrium with all of labor in the archaic sector with the wage there equal to w_a^0, the birth of a modern sector demand curve is described by the lower of the blue demand curves. In the Lewis setting, we would travel "instantly" to D, where this demand curve intersects with the archaic demand curve (in grey). But if there are sector-specific skills that need to be acquired, or if information about new opportunities percolates slowly, the response is more muted in terms of migration — labor in the modern sector rises only to L_m^1 — and correspondingly sharper in terms of wages, which rise to w_m^1, both summarized by the point E^1. This state of affairs could largely persist as demand in the modern sector continues to grow, with wages climbing again to w_m^2 and modern employment to L_m^2, summarized by the point E^2.

What determines these responses in the short- to medium-run? It would all depend on how disparate and new the required skills are, and how quickly information travels. The newer the skills, or the more closeted the information, the more subdued will be the initial migration response, and the more dramatic will be the climb in the modern sector wage. What about the wages in the archaic sector? In general, these will rise as labor begins to pull out, but now observe that the very same forces that lead to a sharper rise in modern sector wages will leads to a *smaller* response in archaic wages (after all, fewer laborers leave sector a when skill acquisition is harder). It should also be noted that if the economy is in the Lewis phase to start with, with archaic wages at work subsistence, an initial draw-out of labor from the archaic sector will have little or no effect on the archaic wage at all. *That* part of the Lewis argument still works. Archaic wages such as w_a^0, w_a^1 and w_a^2 in Figure 6.8 would be clustered closely together.

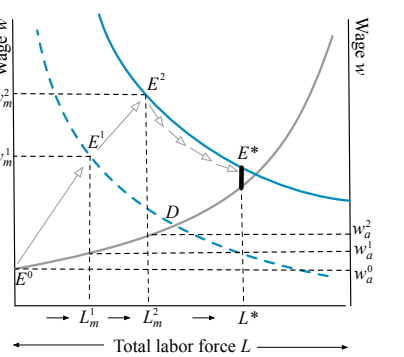


Figure 6.8. Uneven and Compensatory.

6.5.2. Compensatory Change. These observations regarding wages during the labor adjustment process (or "transition dynamic") have important implications for inequality, a central theme in Kuznets' own writings and one that appears throughout this book. In the early stages of structural transformation, the high returns to scarce skills and the inability of many workers to immediately access the modern sector conspire to produce rising income inequality. But that inequality could contains within it the seeds of its own eradication, as Kuznets himself hopefully suggested. High

modern wages generate incentives for individuals in the traditional sector to invest in education and skill acquisition. Certainly, these investments take time — perhaps generations — and may be held back by both financial and institutional barriers (e.g., imperfect credit markets for tuition costs, limited access to training facilities, and household income constraints). But over time — through private investments in education and vocational training, public policies that attenuate credit constraints or group-based exclusion or informational gaps, or generalized economic improvement — one expects the disparity in wages to be whittled away.

Figure 6.8 depicts this graphically by the sequence of arrows that run from a point such as E^2 to the longer-run equilibrium E^*, as compensatory adjustments in human capital eat away at the wage differential. All that remains is the squat black bar, which delineates the minimum cost of skill accumulation that can separate the two wages.

This variant of the structural transformation model provides a rationale for the inverted-U shape of income inequality over the development process — the so-called Kuznets Curve — with inequality first rising and then falling. But I don't want this to be the takeaway lesson, because its prediction of a single inverted-U shaped process can be misleading. Inequality first rising and then falling is the byproduct of a *single* transformation. But as we've already emphasized, there could be many such transformations, each with its accompanying sequence of uneven and compensatory changes. Think of this model as showing us one of the many rungs in that transformational ladder. Ongoing uneven change followed by waves of compensatory adjustments in occupational choice — *that* is the useful takeaway.

6.6. A Comment on Growth in Lewis and Kuznets

If you've been reading all this carefully, you will notice that our model is "rigged" in one important aspect. We've assumed that it is the manufacturing sector that's growing, fueled by the capital accumulation process depicted in equation (6.6). But why can't the agricultural sector grow as well? It *could*. We could have an analogous growth equation for K_a — an agrarian version of equation (6.16). In fact, there is no reason to presume that manufacturing growth is fueled by the manufacturing surplus — at the present level of abstraction, that surplus could just as easily fuel growth in agriculture.

One asymmetry that comes to mind is that K_a might be land, and land cannot be freely accumulated. Good point: but it isn't always valid. Many countries (Brazil comes to mind) have claimed vast swathes of forest land for cultivation, so K_a could increase even under the narrow interpretation that it's all land. But more than that, agriculture benefits from the application of machinery, fertilizer, and so on, and *those* could be accumulated to eke out greater output. Additionally, technical knowhow — e.g., A and α in (6.1) — could change. For instance, research into crop varieties could produce more output from the land, even controlling for fertilizers, machinery and the like.

In short, our open-economy assumption leaves little or no room to connect the *production structure* of the economy to its *consumption structure*. Technology and prices will determine the direction of specialization via comparative advantage. The resulting composition of *trade* will depend on preferences, but not the composition of *production*. An open economy need not exhibit any balance in supply and demand balance at the domestic level. It could export its surpluses and import its deficits. So the assumption of an open economy can be somewhat problematic at two levels. It

is intrinsically unrealistic as an assumption: trade is always imperfect, for reasons ranging from transportation costs and cross-national supply uncertainties to political constraints and the need for self-sufficiency in a strategic global environment. And it is too loose in its implications: by and large, countries have indeed moved *from* the archaic (or agrarian) economy *to* the modern (or manufacturing) economy. It is time to take account of the pattern of demand for the products being produced, of surpluses and deficits at the domestic level, and to seriously entertain the possibility that the relative price p must have to move to equate domestic supply and demand.

Export-Led Structural Transformation in Bangladesh

In 2023, Bangladesh was one of the largest exporters of textiles in the world, second only to China, with a global export share of over 6%. Readymade garments alone account for over 80% of all its exports, replacing traditional agricultural products such as jute and leather. The sector now employs over 4 million workers, mainly women, and millions more via ancillary connections. It is a classic example of export-led structural transformation, though many of the workers return to their villages for the harvest (Heath and Mobarak 2012, McAuliffe and Ruhs 2017, Srivastava and Pandey 2017).

There are elements of both Lewis and Kuznets at work here, the former because of the reserves of labor in agriculture, and the latter induced by the inherent uncertainty and discomfort of the situation. Was the better deal for real? Would the change in the way of life be worth it? Remember, we are talking about individuals and families that have not moved, *ever*, in their lifetimes, as it was for generations of their ancestors. In a seminal field experiment, Bryan, Chowdhury, and Mobarak (2014) encouraged a sample of 1,292 landless rural households to migrate during the 2008 lean season, by covering roundtrip bus travel costs to nearby cities. It's not surprising that this intervention increased migration when it was implemented (why wouldn't a young person hop on an expenses-paid trip and check it out?), but what it brought home was information. And better incomes. Migration significantly improved consumption in households with migrants — by about 700 calories per person per day — and half of those incentivized to migrate chose to do so the following year without any additional inducement.

Structural transformation changes not only the lives of those who migrate, but also the economies they leave behind. A subsequent experiment in 2014 (Akram, Chowdhury, and Mobarak 2017) takes the earlier intervention a big step forward. The authors offer transport subsidies to 5,792 households across 133 villages in Rangpur, Bangladesh, randomly varying the proportion of offers made in those villages. In some villages 14% of eligible households were offered the grant (the "low-saturation: treatment), while in others 70% of households were offered the grant ("high-saturation"). This generates labor supply shocks of different magnitudes in different villages. What did they find?

First, the decision to migrate is cross-reinforcing. When more offers are made, each beneficiary becomes more likely to take up *their* offer, as it becomes easier to travel together with friends also receiving offers. Even village co-residents not directly receiving any offer start migrating. As before, migration leads to higher incomes (and the migrating groups also choose to re-migrate of their own volition). Second, migration affects the lives of others in the village via "general-equilibrium" changes in wages and prices. In high-saturation villages, the agricultural wage rate w_a climbed, as did the work available per village worker during the lean season. Even the migrants benefited: it was easier for them to find work during the weeks they returned home, as other workers were away. Local employers reported higher wages when the travel grant was offered, and

during the subsequent seasons which saw high remigration (much to their displeasure, presumably). Finally, money coming into the village can also change prices of local goods and services, especially for nontradeable or perishable goods for which village markets are not well integrated. Indeed, the price of fish — a perishable good in the absence of refrigeration — increased in high-emigration villages: clearly, the extra income permitted greater consumption of such items. (In contrast, there was no price change for non-perishables such as rice.) One would expect that with greater village integration, these price effects would be generally attenuated, though they must occur to some degree as structural transformation becomes widespread; see Section 6.7.

6.7. Structural Change with a Limited Supply of Basic Goods

We turn, then, to a setting in which the price level p adjusts so as to equate domestic demand and supply for goods. That is, our model economy cannot freely export and import.[69] This closed-economy viewpoint emphasizes agriculture as a supplier of twin resources: labor, and an agrarian surplus to feed that labor, which we are going to link to the work subsistence z. It also leads to a distinct insight that we first encounter in the work of Michal Kalecki (1954) and V.K.R.V. Rao (1958).

To develop these ideas, we will focus on the agriculture-manufacturing interpretation of our two sectors, and we presume that the work subsistence must be consumed entirely in the form of food, produced in the agricultural sector. All wages over and above z are taken to be spent on the manufactured good; it serves as the "luxury good" in our simple two-sector world. This is a particularly sharp form of non-homothetic preferences, in which one good serves as the basic provider of subsistence needs, and has no additional consumption value beyond that.[70]

6.7.1. The Kalecki-Rao Constraint. We must now keep track of *domestic* supply and demand. Agrarian output Y_a must equal the domestic consumption of food. That consumption is trivial to compute once we know what overall employment is. If there are $L_a + L_m$ employed workers, each demanding z units of work subsistence, then, remembering that survival subsistence has been normalized to zero,

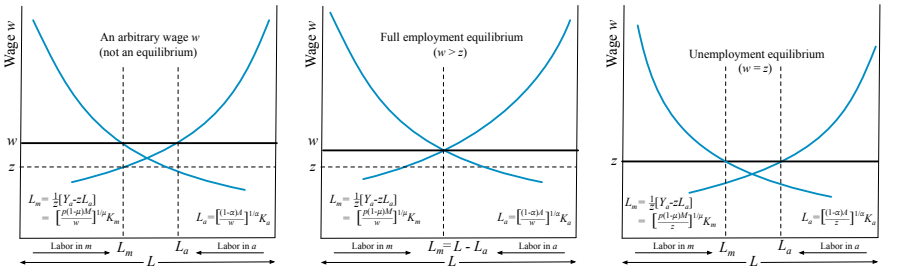
$$Y_a = z(L_a + L_m) \tag{6.7}$$

is the condition that expresses the equality of domestic demand and supply. This new requirement is so central that we give it a name: the *Kalecki-Rao constraint*. But let's go a bit more slowly to make sure we understand how it works. Assume that both sectors are profit-maximizing, and pick any wage $w \geqslant z$. Then, given K_a, profit-maximization pins down labor demand curve L_a in agriculture.[71] The Kalecki-Rao constraint states that the *excess* agrarian output $Y_a - zL_a$ over and above work subsistence in agriculture

[69] Indeed, this framework could serve as a perfectly acceptable model of the world economy, except, of course, that labor is not (to a first approximation) freely mobile worldwide.

[70] See Kalecki (1954), Baland and Ray (1991) and Matsuyama (2002) for similar specifications. As always, you must be careful here not to take the phrase "one good" too seriously. More comprehensively, we mean the production of the basic necessities that are required for healthy human labor (basic food, clothing, shelter, medical facilities, and so on).

[71] If we use the family-farm variant of the model, the argument in the main text has to be amended. Suppose that agriculture absorbs L_a laborers. Then w is the resulting average product (in the family-farm variant of the model). So we pin down w in this way, and what is more, that w had better be at least z, otherwise the work subsistence won't be met.



(a) An Arbitrary w **(b)** Unemployment **(c)** Full-Employment

Figure 6.9. Equilibrium Unemployment and Full Employment under the Kalecki-Rao constraint.

is precisely what's available to support employment in the m-sector, so:

$$L_m = \frac{1}{z}\left[Y_a - zL_a\right]. \tag{6.8}$$

In fact, equation (6.8) is just another way of writing equation (6.7). *This* is the value of L_m that employers in the modern sector must be coaxed into willingly employing — no more and no less. Because we've already started with some given w, the output price p in the m-sector must do the heavy lifting to bring labor demand into line: it must adjust so that profit-maximizing labor demand in the m-sector is exactly the L_m in equation (6.8). To summarize, we took an initial stab at guessing w, and then in rapid succession deduced what L_a and L_m and finally the relative price p would need to be. How do we know that our initial guess w is the right one? Thankfully, we can invoke the same logic as in the Lewis model. *Total* employment can be no larger than the total labor endowment of the economy. Moreover, if it is strictly smaller, the wage w must be at work subsistence z. This completes our description of equilibrium.

For those of you who prefer algebra, the Appendix translates this verbal account into equations. But Figure 6.9 doesn't do a bad job either. For each $w \geqslant z$, it notes (i) what L_a must be by profit-maximization, (ii) what Y_a is via the production function $Y_a = A(K_a, L_a)$, and (iii) what L_m needs to be via (6.8), while presuming (iv) that p will adjust so that profit-maximizing m-sector labor demand is indeed that same L_m.

Panel (a) of the Figure depicts one such outcome: the wage is *strictly* above work subsistence, but total labor absorption is below L. But that can't be an equilibrium: unemployed workers can bid the wage down below w. As w falls, more agrarian labor is hired, and so more agrarian output is produced, allowing (6.8) to sustain a larger number of employed individuals. So $L_A + L_m$ increases as w falls. Panel (b) of Figure 6.9 illustrates the case in which overall employment falls short of L *even when* the wage has sunk to work subsistence z. This will occur when L is large or agriculture is relatively unproductive, and it leaves some labor unemployed. Otherwise, if labor demand is larger than L when $w = z$, we must examine various $w > z$, until $L_a + L_m$ *just* equals L and there is full employment; see Panel (c) of Figure 6.9.

In short, everything runs parallel to the open-economy model, with one crucial difference. There, p is fixed and the domestic supply of basic needs need not equal demand — there is no constraint of the form (6.7) or (6.8). In contrast, p is endogenous here, and must adjust to ensure that the new constraint is always met.

We can view structural transformation as occurring when capital K_m is accumulated in the modern sector, just as in the Lewis model. The singular difference is the Kalecki-Rao constraint, which recognizes that domestic agrarian production pins down the overall employment potential of the economy. As we shall now see, this constraint paints a very different picture from one that neglects the domestic production of work subsistence. In an economy that isn't open, the latter approach can be misleading.

The Visible Hand? Kalecki-Rao in the Soviet Union and China

Of the newly created Soviet Union of the 1920s, Maurice (Dobb, 1966, p. 208) wrote: "The rate at which agricultural production could expand and afford a growing supply of raw materials for industry *and foodstuffs for industrial workers* appeared as the crucial question in economic discussion in the second half of the decade: an issue upon which all other hopes and possibilities rested" (emphasis mine). It wasn't that agricultural investment was nonexistent: large imports of tractors occurred in the 1920s, the majority of these going to the collective or state farms. However, the marketed surplus of food grain continued to be abysmally low: in 1925–26, while the total agricultural land area under cultivation was close to that of pre-war sown acreage, the surplus on the market was only around 70% of the pre-war amount. With the land reform of 1917, land was now more equally distributed and it was clear that the newly endowed peasantry were eating more and selling less.

There was no end of fretting and fuming about the problem of agriculture. Oddly enough, some intellectual hardliners centered around Trotsky in the mid-1920s continued to view "further development as only possible in the existing situation in Russia if industry were to expand at the *expense* of the peasantry" (Dobb 1966, p. 183). This view contrasted with the relatively moderate earlier views of Lenin, who regarded agriculture as a sector to be (at least provisionally) treated as complementary to the development process, creating and retaining a *smytchka*, or bond, between the peasant and the industrial worker. In the mid-1920s the government embarked on a program of food price stabilization that limited competition among purchasers of grain and required all private traders to register with the government. State collecting organizations, which set price limits on purchases, came to occupy a larger share of the grain trade. The policy of price stabilization was largely successful, but grain purchases collapsed, limiting the supply of food to the towns.

In 1928, Stalin reacted thus to this state of affairs:[a]

"What was to be done to make up the lost ground? It was necessary first of all to strike hard at the *kulaks* (rich peasants) and the speculators …Secondly, it was necessary to pour the maximum amount of goods into the grain regions …[But] from April to June we were unable to collect even 100 million poods[b] …Hence the second relapse into emergency measures, administrative arbitrariness, violation of revolutionary laws, raids on peasant houses, illegal searches, and so forth, which affected the political conditions of the country and created a menace to the *smytchka* between the workers and the peasants."

This was a two-edged sword: grain was wanted, but despite the intended pouring of the "maximum amount of goods into the grain regions," the short-run gains in food collection were met only with longer-run resistance. Ethnic tensions played a role as well; see the account of food procurement and Ukrainian famine mortality over 1932-33 by Markevich, Naumenko, and Qian (2024). The Ukranian tragedy was part of a historic decision to embark on state collectivization of agriculture, a monumental story in itself.

As in the Soviet Union, China's command and control system during the 1950s and 1960s aimed to procure all food above agrarian subsistence to provide urban work subsistence (or build reserves). As the collectivization experience in the Soviet Union

showed, incentives for farmers could be minimal under such a policy. To circumvent this, the Chinese government set up moving regional targets based on verified audited reports of *past* regional production net of subsistence estimates. These procurement targets would have to be met: the peasants could keep the rest. This goes to the opposite extreme: yes, incentives are high, but in times of a sudden and involuntary dip in agrarian output, widespread starvation could be a real possibility. Meng, Qian, and Yared (2015) trace China's Great Famine (1959-1961) in part to this policy.

An estimated 45 million people died in the Great Famine, though despite the drop in food production in 1959, aggregate production was still far above subsistence needs (reminiscent of Amartya Sen's 1981 account of the Great Bengal Famine in 1943). Even more surprising is the fact that mortality rates were *higher* in regions that historically produced more food per capita. As Meng, Qian and Yared argue, this is a smoking gun, suggesting that historical past production was used to set procurement targets that were rigidly adhered to when the downturn came. Higher-production regions not only had higher targets, they suffered a larger absolute drop in food output — assuming that the proportional fall in all regions was similar. *This* is the flip side of providing incentives by allowing farmers to keep all production above target. It means that when the gap between production and target narrows, no forgiveness is shown either. So there can be intense famine in historically productive regions even if aggregate production was high enough to avoid famine. As Meng, Qian and Yared argue, had food production been redistributed equally during the famine years, the famine could have been avoided entirely.

The Soviet and Chinese experiments had disastrous consequences. Developing countries today will understand that large-scale collectivization is not an option. They will have to solve this problem differently, but the problem *is* there all the same.

[a] Stalin's speech (quoted in Dobb 1966) was made to the Leningrad organization of the Party.

[b] A pood is a traditional weight unit used in Russia, Belarus, and Ukrainel, corresponding to about 16.38 kilograms.

6.7.2. Premature Modernization. The first thing to note about market equilibrium in the closed economy is that employment is not as high as it could be, whenever there is some unemployment to start with; that is, whenever we are in the realm of Panel (a) of Figure 6.9. Imagine that a social planner were to tinker with the market outcome, pushing all L_m workers back into agriculture. By equation (6.7), the earlier agrarian output provided subsistence for $L_A + L_m$ people. Now with all of them back in agriculture, agrarian output would be even higher; that is, it would be given by

$$Y_a' \equiv F(K_a, L_a + L_m) \text{ instead of merely } Y_a \equiv F(K_a, L_a),$$

and this higher output would be high enough to pull even more individuals out of non-working survival and into healthy employment.

What went "wrong" here? The market mechanism based on profit-maximization generates profits over and above the subsistence requirement z. Those profits then set up a demand for non-agrarian goods, feeding the birth of a manufacturing sector. This is all very well and good for landowners and industrial capitalists in manufacturing — both get to consume products beyond mere basics — but at the expense of leaving behind an unemployed and impoverished population of size $L - L_a - L_m$. Some of that unemployment could have easily been absorbed, but the market equilibrium falls short on this score. The Appendix contains a variation on this theme, connecting premature modernization to the way in which agrarian production is organized.

This is one of many encounters with an apparent social injustice that we will face in this book, and it is a good opportunity for you to test-drive your basic ethical stance on things. Is this a "market failure"? One view would argue that it certainly is: there are individuals deprived of basic necessities for a healthy working life, while others consume luxuries. Another viewpoint would argue that there is no obvious sign of any failure; after all, you can only benefit one group (the undernourished unemployed) by taxing another group (the well-to-do profit earners). It's your call: that's why I put the word "wrong" in quotes. Personally, the social inequity of the situation bothers me.

6.7.3. Jobless Modernization. The second feature of structural transformation in the closed economy is that the Lewis channel — his beloved "economic development with unlimited supplies of labor" — breaks down. As in the Lewis "surplus labor" phase, there is unemployment in the regime depicted by Figure 6.9(a). But unlike the Lewis setting, the Kalecki-Rao constraint prevents that unemployment from being absorbed, *even when* modern sector capital is growing.

To see this, begin with the surplus labor phase, so that equation (6.7) holds only for $L_a + L_m$ smaller than the total labor force L. Now suppose that there is an infusion of investment into the modern sector, so that K_m goes up. Won't this raise the demand for labor in manufacturing? Not so fast, says the Kalecki-Rao constraint: (6.7) still needs to be satisfied. In fact K_m appears nowhere there, so despite the fact that it's grown, there is no change in labor employment in either sector! This employment stagnation is "implemented" by a lower price p, which falls by enough to offset the greater labor demand in manufacturing from the rise in K_m.

This is truly a dramatic difference from the open-economy setting, in which an increase in K_m generated greater employment with impunity. Because the Kalecki-Rao constraint binds, the relative price p moves against manufacturing, reducing — no, eliminating — the incentive to hire more labor. Manufacturing *output* rises, but only because there is a larger stock of machines in the manufacturing sector. Agrarian output remains unchanged. We are left with a higher capital-labor ratio in manufacturing, with no accompanying employment increase. This is jobless modernization.

In sharp contrast to the open economy model, then, structural transformation occurs *only when the agrarian surplus increases*. To see this, suppose that we increase K_a or agrarian TFP. Agrarian employment L_a will then go up (of course), but L_m must rise as well. Let's trace the steps. First, agrarian output rises. Some of that new output must go to support the higher L_a (they consume the work subsistence), but there is still a surplus left over that can support greater employment in manufacturing. Formally, while both Y_a and L_a rise, the expression

$$Y_a - zL_a$$

must rise as well, allowing a larger value of L_m to be supported under the Kalecki-Rao constraint (6.8). Thus an increase in K_a (or agrarian TFP) ends up doing what an increase in K_m (or manufacturing TFP) could not on its own: it raises manufacturing employment and contributes to structural transformation. (The Appendix to this chapter contains a more formal version of the argument.)

We've focused on the Lewis-like regime in Panel (b) of Figure 6.9, because it is there that the Kalecki-Rao constraint emerges in its starkest form — there is a pool of untapped labor which cannot be tapped when K_m or manufacturing TFP rises. But the

constraint has a similar impact even under full employment (Panel (c) of Figure 6.9). Now the agricultural sector is large enough so that its output feeds everyone in the economy at their work subsistence. The market wage might exceed that subsistence level, so now even the workers are in the happy position of being able to consume some part of the manufacturing output. But the economy continues to be stuck as far as structural transformation is concerned. If K_m rises, there can be no knock-on effect on manufacturing employment or wages w_a and w_m. The same demand for labor in agriculture will be maintained. The terms of trade p will additionally fall to maintain the same demand for labor in manufacturing. Manufacturing output will rise — after all, K_m is higher to start with. *But no reallocation of labor can occur.*

Our bottom line is this: if we simply throw all our resources at the modern sector in an effort to increase capital or TFP there, we have jobless modernization. Manufacturing output will climb, but employment must stay put. This is at first glance an unintuitive result. It runs counter to both the Lewis argument, as also traditional Keynesian arguments based on deficit financing (Rao 1958). On the other hand, if we throw some of those resources at the *agrarian* sector — the very sector we are trying to transform away from — we get employment traction in manufacturing. This is the lesson that the closed-economy Kalecki-Rao constraint teaches us.

6.7.4. Two Variations, and a Postscript. So far, we've assumed that work subsistence exceeds survival subsistence (the difference is given by z), and additionally that once the work subsistence is met, no more basic goods are needed or consumed. Several aspects of this specification can be modified.

First, one might vary the relative importance of work subsistence to survival subsistence. In our discussion above, we've simply normalized the latter number to equal 0, but now let's give it a name, i, and bring it explicitly into the picture. Then a modified version of the Kalecki-Rao constraint would read:

$$Y_a = sL + (z - s)(L_a + L_m)$$

which reduces to our specification in (6.7) or (6.8) when $s = 0$. I'd now like you to entertain the opposite assumption: that $s = z$, which means that work or no work, the same minimum of $s = z$ applies to everyone. In short, the Kalecki-Rao constraint would then apply to the *entire population*, working or not. The mechanics of this variation are similar (though not identical) to the case of full employment, the similarity arising from the requirement that $z = s$ has now to be produced for everyone. If the agrarian capital or agrarian TFP of the economy is very low, then unlike a restricted employment level as described in equation (6.7), people will simply die of starvation — a grim Malthusian scenario. Otherwise, *exactly* zL units of agrarian output will be produced, agrarian employment will be just about sufficient to do that job (no more and no less), and the remainder will be employed in manufacturing.

But, for the same reasons discussed earlier, a rise in m-sector capital or productivity will have no effect on manufacturing employment, though it will raise output there. After all, L_a cannot change because the right amount of food has to be produced, and therefore L_m cannot change either. As before, it is only an increase in *agrarian* capital or productivity that can have positive repercussions for manufacturing employment.

As a second variation, suppose that both the agrarian and the manufactured good are used in consumption even at very low levels of income, and suppose moreover

that there is no hard consumption minimum: that the consumption of one always diminishes as its relative price increases. Then, there is no Kalecki-Rao constraint, or at least not one in the hard sense of the term implied by (6.7). Now either sector can expand in tune to its capital expansion or productivity growth. The consequent drop in its relative price will encourage consumption to move away from the other sector, allowing that sector to shrink without violating any constraint such as (6.7).

This modification destroys any fundamental asymmetry between the two sectors. Either can expand or contract to some degree. There is no sense in which the agrarian sector would "come first" in poor economies, followed by a subsequent rise in manufacturing production. This nihilism arises because we are not taking a stance on how preferences for the two goods changes with development and higher incomes. As soon as are willing to say that agrarian consumption comes first, followed by manufacturing consumption (as income rises), then a sequencing is naturally introduced into the timing of growth in the two sectors.

Non-homothetic preferences, in which the composition of demand shifts towards the manufactured good as income climbs, induces a structural transformation as the economy grows. Our extreme specification of attaining a minimum in one good before switching to the other is an extreme version of non-homotheticity, one that makes the Kalecki-Rao constraint very stark indeed. We don't need that extreme view, but at least as far as the agrarian-industrial transformation is concerned, it is surely some degree of non-homotheticity that brings the direction of that transformation to life.[72]

A postscript: is Lewis-Kuznets or Kalecki-Rao a better depiction of structural change? It depends on whether the sector releasing labor is also producing essential goods (as in the case of agriculture), and whether the economy as a whole is open or closed. In an open economy, a *domestic* surplus is not fundamental to structural change. Non-basic exports could fund basic imports. Indeed, it is possible in principle to have *nobody* in the agricultural sector, and rely entirely on imported food. For instance, Singapore imports over 90% of its food. But such openness is generally the exception rather than the rule. There are many reasons for this, some indicated in our discussions above, but the fundamental answer must ultimately lie in the political desideratum of *self-sufficiency*. Food is so much the foundation of all other activity that most societies cannot bear to contemplate a contingency in which they must depend on others for this most fundamental of wants. Such fears go some way in explaining why agriculture enjoys extraordinary protection in many developed countries today.

It is in this context that the closed economy setting becomes salient. Certainly, labor must move to manufacturing in the course of structural transformation. It is agriculture that nurtures that labor supply. But at the same time, labor must receive its minimal work subsistence, and it is also agriculture that must generate the surplus to feed that labor. In general, no social planner is entirely in charge of this historic twin movement of resources as the transformation occurs. The Invisible Hand of the market is very much at work (though see the Box on the Soviet Union and China for a partial exception). Labor moves of its own volition, seeking out opportunities for a better life. The food surplus moves in a different market altogether, as employed urban workers

[72] Baland and Ray (1991) and Eswaran and Kotwal (1994) combine non-homothetic preferences with the Kalecki-Rao constraint. For more on non-homothetic preferences in the context of structural transformation, see Matsuyama (2002), Comin, Lashkari, and Mestieri (2021), and Fan, Peters, and Zilibotti (2023).

must still seek to buy food to meet their subsistence needs. The two markets operate in tandem, and determine the pace and overall ease of the structural transformation from a rural to an urban way of life.

6.8. Policies and Politics

The basic needs requirement, epitomized in the Kalecki-Rao constraint, argues for policies that stimulate agriculture in the sense of subsidizing (non-human) inputs to that sector, such as water, fertilizer and agricultural machinery. It is only in this way that more labor can be supported in the manufacturing sector, at least in a closed economy. Recall the process by which employment growth is stymied in manufacturing when only K_m (or M) increases. The market responds by reducing the price of manufacturing relative to food. Put another way, food is now more expensive relative to manufacturing, or more colorfully, the "terms of trade" have turned against manufacturing.

6.8.1. Agrarian Taxation. Industrialists, manufacturing lobbies, and governments eager to seen as modern economic powerhouses, are typically displeased with this outcome. From the perspective of entrepreneurs pouring fresh capital into manufacturing, all of the employment gains (and much of the hotly anticipated industrial expansion) are being "unjustly" eaten away by a rising price of food — or more precisely, by a rising real wage relative to the price of manufacturing output. The politics of this can turn very nasty indeed. In fact, they can give rise to an anti-agrarian bias that could be highly counterproductive. Industry develops a vested interest in *taxing* agriculture. This is the source of the tension between agriculture and industry.

Who would support agricultural taxation? Industrialists would. Such taxation keeps agricultural incomes down, reducing industrial wages. Industrial *workers* would not support such taxes, not necessarily out of solidarity to farmers, but because it would increase out-migration from agriculture and job competition in Industry. And farmers certainly oppose the policy: they are the ones who are taxed![73] So this could well be a politically polarized issue, both in capitalist and in mixed economies. (See Box on the Soviet Union, where the agriculture-industry divide was especially problematic.)

Kalecki-Rao casts a deep shadow here. If farmers believe that greater output will be systematically taxed away, then they will lose all incentives to create, improve, or maintain productive inputs such as irrigation facilities or soil quality. There will be underinvestment in agriculture, and this underinvestment will have repercussions via the basic needs constraint. The tension between a static or short-term view of agriculture as a sector to be squeezed for *current* surplus and a dynamic or long-term view of agriculture as a sector to be invested in and encouraged for the generation of *future* surplus, represents an economic issue of great importance. Walking this tightrope is no easy task and can have enormous political connotations.

In practice, agrarian taxation in developing countries has been approached with caution. For one thing, farmers form a large voter base and antagonizing them isn't a pleasant prospect. For another, agricultural income is typically hard to measure, making it difficult to tax, though direct taxes on larger holdings or income are

[73] For large landowners, the situation might be more complicated. Their response depends on the intensity of the taxation and the ease with which some of it can be evaded. Certainly they prefer no taxation to taxation, but taxation could also have the effect of driving down rural wages. To the extent that large landowners are significant employers of labor, this effect may be beneficial.

administratively more feasible. It is safe to say that measured as a ratio, agricultural income contributes far less to direct taxes than non-agricultural income does.

6.8.2. Agrarian Price Manipulation. A second line of policy, especially in those countries where landed elites and farmer form a powerful political force, consists in incentivizing agriculture via price manipulation, or taxing it in largely hidden ways. Food can be coaxed instead of coerced into the market by lucrative "price supports" for output or subsidies to agricultural inputs. Of course, as we've already seen, higher output prices are a more costly route as far as industrial capitalists are concerned: to them, every concession to agriculture has repercussions for the industrial wage, either directly (as agrarian incomes rise) or indirectly (via a higher relative price of food).

That is why the typical price support program has two parts, First, it offers pre-announced procurement prices at which the government stands ready to buy food grain. The idea, of course, is to increase the marketed surplus of grain. At the same time, governments are often unwilling to pass on these prices to urban consumers, partly because these consumers are typically incensed by higher prices (despite salary adjustments) and partly because of the effect on the industrial wage. Thus price support programs are usually accompanied by a consumer subsidy: the procured food is sold at or below market prices by the government. Of course, someone has to pay for this subsidy. It usually comes out of the government budget, spreading the cost widely rather than focusing it on those who principally consume food, or their employers.

But output prices are not always kept high. One option, which has the dubious advantage of lacking transparency, is to maintain an overvalued exchange rate. While explicit overvaluation is increasingly rare (though still sprinkled here and there from [A]rgentina to [Z]imbabwe), it is possible to maintain an effective overvaluation via tariff or quota-based restrictions on imports. An overvalued exchange rate serves many purposes, and this is not the place to discuss them, but one implication is that export prices are kept artificially low (in domestic currency). This has the effect of discouraging or even reversing food exports and shifting food sales into the domestic market. The policy has sufficient opacity about it — farmers may not be aware that the exchange rate is overvalued and reduces their export earnings — and it has the desired impact of making food available to urban consumers without a price rise.

Such policies, opaque and (therefore) politically expedient though they may well be, do involve serious efficiency losses, not to mention the possibility of serious crises triggered by balance-of-payments deficits. Moreover, with a sudden liberalization of the exchange rate, the opacity may just as quickly disappear and be replaced with a (now more transparent) prospect of an outright ban on food exports. The Indian government faced this dilemma after its 1991 devaluation and subsequent trade liberalization. Domestic price pressures on food items such as onions, sugar, and wheat prompted *ad hoc* export controls to contain inflation.

An alternative to output price manipulation is the policy of keeping *input* prices low. Water, electricity, and other inputs may be supplied free or at low prices. In India, the fertilizer subsidy *alone* represents a fat chunk of the government budget: in 2022-23, just this one subsidy accounted for over a quarter of personal income tax revenue![74]

[74]The 2022-23 subsidy was estimated to be in the region of INR 2.5tr, while personal income tax revenues (including securities transactions tax) came in below INR 10tr.

Perhaps there is no way out but to endure the short-run rise in food prices, and the consequent temporary shift in favor of agriculture, with the understanding that this can lay the foundation for broader transformation.

The box on the Soviet Union and China tells us how dangerous an anti-rural system of collectivized food procurement can be. China's post-1978 reforms — its dismantling of collective farms under the household responsibility system — allowed farmers to sell their surpluses at market prices. Along with the elimination of self-sufficiency mandates in place since the Great Leap Forward in 1958., these reforms sharply increased productivity. Between 1978 and 1984, agricultural output rose by over 40%, and TFP returned to pre-collectivization levels within a few years (McMillan, Whalley, and Zhu 1989; Wen 1993). Lin and Wen (1995) attribute most of this growth to the restoration of price incentives, rather than to cropping pattern reforms.

In contrast, Russia's post-Soviet transition largely neglected agriculture. Collectivized structures remained in place through the Gorbachev and Yeltsin years, with little meaningful reform. When the Soviet bloc collapsed, so too did the system of food imports sustained through barter or soft credit arrangements. With no domestic productivity recovery, no credible food pricing reform, and the need to pay for food imports from the rest of the ex-Soviet bloc with armaments and heavy-industry products, not to mention hard currency, Russia faced shortages and inflation.

Yes, there are political difficulties of tolerating an immediate food price rise.[75] But the Chinese case still suggests that a front-loaded pro-farmer price correction, if managed credibly, may avert the more damaging cycle of chronic food shortages, suppressed rural incomes, and industrial wage pressure. Such initial adjustments — even when painful — could ensure long-run price stability and export competitiveness.

There remain other gaps to fill: as we shall see in the chapters to come, agricultural growth is often limited by access barriers to capital and credit, as well as intrinsic disincentives that arise from agrarian contracts (which occur primarily because such contracts need to play the double role of assuring *some* incentives and *some* insurance). Land reform, credit expansion, and infrastructural investment all go a long way to assuring agricultural and industrial growth. There would be no need to do this if the markets to ensure such developments functioned smoothly, but as we will see, they do not. A fuller consideration of these issues is postponed to Chapters 21 and 22.

6.9. Structural Change as Spillover into Informal Sectors

As already noted, "formal" and "informal" sectors are ubiquitous in all countries, with former operating within an institutionalized legal framework. Firms are typically required to pay minimum wages and must conform to certain standards of safety, compensation rules, pension schemes, and the like. They must also pay taxes. Formal sector firms operate under an institutional umbrella of rules and regulations. Their employees often belong to a union. Collective bargaining is not uncommon.

At the same time, formal sector firms have access to benefits that their informal counterparts lack. They might be given infrastructural facilities, such as access to subsidized electricity. They might be allocated foreign exchange quotas or granted the

[75] In the case of China led by Deng Xiao Ping, the base of the Chinese Communist party was formed by the farmers (who supported the party through the Tiananmen episode).

right to import certain inputs. They can issue shares and they have access to banks for funding (though they must then be accountable to their shareholders or their creditors). They are protected by bankruptcy laws and implicit or explicit forms of insurance. All in all, there are both pros and cons to being in the formal sector, and the former typically outweighs the latter above some minimum level of economic activity.

In contrast, the *informal sector* is a loose amalgam of businesses or individuals that escape the cover of many of these regulations and do not receive access to privileged facilities. Think of hawkers, roadside barbers, family-owned farms or shops, domestic servants, rickshaw pullers, or the kid who helps sell tickets on the bus, even beggars. The informal sector usually does not adhere to norms of minimum wages, retirement plans, or unemployment compensation. They do not pay taxes and they receive little government support. These firms or businesses are quasi-legal, and depending on the exact laws in place (often unenforced), they might even be illegal. As we have seen already in Chapter 2, a large fraction of the labor force comes under this classification.

The informal-formal structural transformation involves a change in government capacity, such as the ability to monitor, or audit, or enforce legal contracts, and the consequent enveloping of economic actors within the formal fold. Likewise, on the part of the citizenry, economic development entails a shift in firm organization as firms become larger, a willingness to submit to a codified rule of law (perhaps in lieu of a social norm), and will very often require an entirely different set of educational qualifications. Figure 6.10 shows how the share of labor in the informal sector declines as a country's per-capita income climbs. This transformation is tempered to some degree by the fact that a growing formal sector can be accompanied by growing informality, as many take up informal occupations, provoked by an inability to find a job in that very same formal sector. The rise of the "gig economy" in economically developed countries bears recent testimony to this ambiguity.

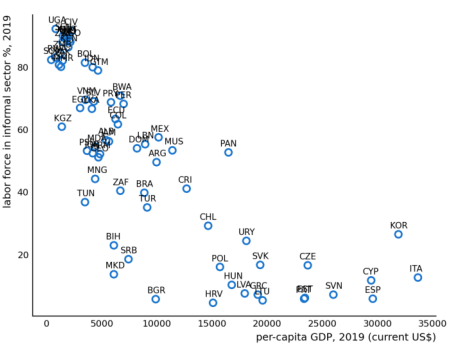


Figure 6.10. Labor Shares in the Informal Sector.

A related and deeper ambiguity appears in the manufacturing-services transition. From the perspective of non-homothetic preferences, it is natural to expect that richer countries will display a larger income share in services. But, as already noted in Section 6.2.2, services abound in the informal sector. Because informality is high in developing countries, this muddies the waters of the services transformation. The small trader or shop-owner, the cobbler and the barber: these are genuine service providers, but they are typically informal as well. Therefore, "services" could grow, not in some intrinsically dynamic way, but because of a failure in manufacturing to absorb labor that's eagerly spilling out of the agrarian sector. This is a very different viewpoint, and it needs a distinct adaptation of the core model of structural transformation. The discussion that follows is based on a classic contribution by Harris and Todaro (1970).

6.9.1. Harris-Todaro. Begin again with Sectors a and m. The starting point of the Harris-Todaro model is that wages are "too high" in the m-sector relative to market-clearing levels. That could happen for many reasons. The sector may be unionized and subject to collective bargaining. Or the m-sector could be a showcase for enlightened government policy, with minimum wages, pension schemes, unemployment benefits, day care, and other provisions.[76] Additionally, formal sector firms might *deliberately* pay higher wages to screen in workers of better quality or to provide additional incentives for worker effort. We will see more of such contracts in Chapter 23.

In contrast to the high and relatively inflexible wages paid in the formal manufacturing sector, wages elsewhere might adjust freely in response to supply and demand. For instance, an agricultural sector largely based on casual labor may have no unionization. Minimum-wage policies could be difficult or impossible to implement. Moreover, if the bulk of labor is family labor or if the bulk of labor effort is readily monitored (as in the case of harvest labor), then there will be little incentive for employers in these sectors to pay higher wages as screening or incentive devices.

The core of the Harris-Todaro model, then, concerns migration from the a-sector with its flexible wages, to the m-sector where the wages are higher but the prospects of employment are uncertain. As a by-product of this uncertainty, a new sector begins to grow, located close in space to the organized, formal m-sector, but one that is itself informal. At the risk of some exaggeration, this sector can be described as a gigantic waiting room. Entry is relatively easy, but the returns are low. Often, the occupations involve service-provision: as shopkeepers, barbers, shoeshine vendors, errand-runners of all descriptions, domestic help and so on. These services coexist with more conventional formal-sector services (finance, hospitality, retailing, health care), but they are *spillover outcomes*, made out of failed aspirants to the formal-sector dream, or those in waiting, hoping for formal opportunities to come along.

Rural-urban migration decision is akin to leaving behind a relatively sure thing (employment as an agricultural laborer, or life on the family farm) for the great uncertainty of formal employment. The informal sector is a lottery ticket to formal jobs, and like all lottery tickets, it may or may not pay off. Its size does not only reflect the structure of demand or some dynamic productivity change in services. It reflects the failure of the formal sector to adequately expand.

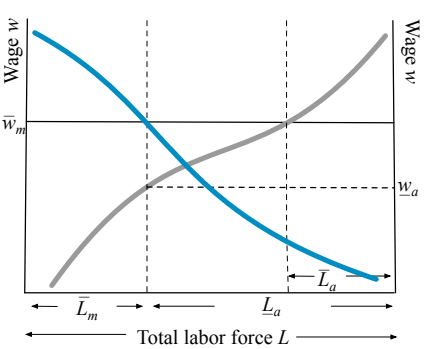


Figure 6.11. A Wage Floor in the m-Sector.

6.9.2. Equilibrium as a Lottery. Figure 6.11 captures this story. The width of the horizontal axis is the labor force, divided between sectors a and m. Labor demand curves are drawn as before, from left to right for m, and from right to left for a. (We will largely ignore the work subsistence requirement in what follows, as it plays no important role.) In the standard two-sector setup, equilibrium would be at the point E, with equal wages in each sector. But that requires flexible wages in each sector. As

[76] Some of these provisions may not raise the wage directly but amount to the same thing.

already noted, we are interested in a setting where the m-wage is "too high" for one reason or another: we depict this by $\bar{w}_m$ in the Figure. It follows that m-firms will hire no more than the amount $\bar{L}_m$ of labor at this wage. Where do the remainder go?

One possibility is that all remaining individuals are employed in the a-sector. In that case, Figure 6.11 tells us that the wage there must drop to $\underline{w}_a$ to absorb them all. But then we have full employment with unequal sectoral wages: $\bar{w}_m \neq \underline{w}_a$. This *cannot* be an equilibrium state: with full employment in both sectors, workers will wish to migrate to the sector with the higher wage. On the other hand, simply imposing the equality of wages across the two sectors is problematic as well. Try it. Figure 6.11 then reveals that only an amount $\bar{L}_a$ can be absorbed in the a-sector, so there is unemployment. The unemployed workers cannot be physically located in agriculture. If they were, they would simply pour into that labor market and drive wages down. Therefore, they must be located in the m-sector, where wages are fixed by assumption. But then we are asked to believe that workers rationally migrate to the m-sector, even though wages there are the same as those in the a-sector, *and* there is unemployment. Under no stretch of the imagination can such a state of affairs be described as an equilibrium either.

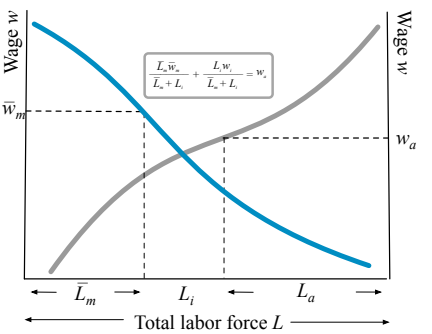


Figure 6.12. Harris-Todaro Equilibrium.

Although these alternatives cannot capture the final outcome, they are suggestive of what an equilibrium might look like. Use Figure 6.12 in the discussion that follows. The main idea is that potential migrants choose between a relatively safe (though possibly unpleasant) option, which is to stay in the a-sector, and the gamble of moving to the m-sector, where a high-paying formal job may or may not be forthcoming. In turn, the probability of getting such a job is determined by the ratio of formal job seekers to available formal jobs. Those who do not get a job are unemployed. We extend the Harris-Todaro interpretation to argue that the "unemployed" are actually in the informal sector i, where jobs or businesses are easy enough to find but pay (relatively speaking) is a pittance. Think of this as a low and exogenously given number w_i.

To summarize the equilibrium, consider the *expected* wage w^e conditional on migration, which is given by neither $\bar{w}_m$ nor w_i, but the combination

$$w^e \equiv p\bar{w}_m + (1-p)w_i, \tag{6.9}$$

where p is the probability of getting the formal m-sector job. As a quick digression, notice that the formula (6.9) can easily be extended to cover additional alternatives. For instance, a failed job seeker in sector m might end up in the informal sector with conditional probability q, and with probability $1-q$ might become truly, openly unemployed, earning nothing at all. Instead of (6.9), that would give us:

$$w^e \equiv p\bar{w}_m + (1-p)[qw_i + (1-q) * 0].$$

Such an equation could be even further extended to include the additional possibility of returning home (at some cost). We won't carry out all these variations here, but

only note that they are easy enough to accommodate. Let us return to the simpler case of just two post-migration outcomes: employment in m or employment in i. If L_i denotes labor absorbed into i, the ratio

$$p \equiv \frac{L_i}{L_i + L_m} \tag{6.10}$$

captures the probability of getting a job in the formal sector. The number L_m proxies for job slots, and $L_i + L_m$ is the measure of the total number of job seekers.[77]

Combining (6.9) and (6.10), we arrive at the Harris-Todaro equilibrium condition

$$\frac{\bar{L}_m}{L_i + \bar{L}_m}\bar{w}_m + \frac{L_i}{L_i + \bar{L}_m}w_i = w_a. \tag{6.11}$$

This equilibrium condition is graphically depicted in Figure 6.12. It represents a situation where *ex ante*, people are indifferent between migrating and not migrating. *Ex post*, they will not be indifferent. The lucky subgroup who land a job in the formal sector will be very pleased that they did migrate, whereas those who are forced to seek solace in the informal sector will regret that they made the move. (But they still hang in there, waiting for the lottery to break their way.)

This is not how we usually envision structural change. From the perspective described here, a services-based informal sector is an outgrowth of the fact that the m-sector does not have enough jobs. It is in a sense a necessary outcome of that fact: if everyone not m stayed in a, the m-sector wage differential ($\bar{w}_m - \underline{w}_a$ in Figure 6.11) would look incredibly attractive and induce enormous migration. By acting as a counterweight to the formal sector, the informal sector equalizes expected payoffs on either side of the migration decision. But that's not the way it's often seen.

6.10. Policies and Politics, Revisited

To many, the informal sector is an eyesore with unpleasant characteristics. Unregulated activity is often held responsible for congestion, pollution, a failure of workplace safety, or crime. Just as in our discussion of policy in the structural transformation model (see Section 6.8), a natural approach is to get the m-sector to do better; to accelerate employment there. It is possible to generate additional labor demand by offering various setup incentives for businesses (such as tax holidays) or ongoing investment incentives (such as better access to credit). The government might itself expand the demand for formal labor via more hiring into public sector enterprises. The goal is to soak up unemployment, or to reduce informal activity. We know from our discussion of the Kalecki-Rao constraint that such a policy may not get off the ground to begin with, because of the basic needs constraint. But we set that consideration aside here.

6.10.1. The Paradox of Job Creation. Such employment-generation policies do initially reduce the size of the informal sector by channeling people from this sector into the greater number of formal jobs that are now available, but matters do not end there. The size of the urban sector is endogenous, and migration must rise in response. The Harris-Todaro equilibrium helps us to explore the nature of the final outcome,

[77] The careful reader will see that this statement is only correct if there is a rapid enough rate of turnover in the formal sector, so that the current level of *employment* can roughly be equated to the number of available *vacancies*. With a smaller rate of turnover, the number of vacancies is not L_m, but some number less than that, and likewise, the number of job seekers is smaller than $L_i + L_m$. The analysis is very similar.

after that fresh migration is taken into account. Let's trace this effect. Suppose that formal employment is raised from $\bar{L}_m$ to $\bar{L}'_m > \bar{L}_m$. Imitating equation (6.11), it is clear that the new equilibrium is given by the condition:

$$\frac{\bar{L}'_m}{\bar{L}'_m + L'_i}\bar{w}_m + \frac{L'_i}{\bar{L}'_m + L'_i}w_i = w'_a, \tag{6.12}$$

where variables with primes denote new values after the policy. How do we compare the magnitudes in (6.11) and (6.12)? With greater migration, the agricultural wage rises (or at least it cannot fall) after the introduction of the policy, so the new expected wage in the urban sector exceeds the old expected wage. But that must imply

$$\frac{L'_i}{\bar{L}'_m + L'_i} \leqslant \frac{L_i}{\bar{L}_m + L_i};$$

in other words, the share of the informal sector in total urban sector employment cannot rise. This is a beneficial implication of the policy: the informal sector does shrink, *measured as a fraction of the total urban sector*.

However, there is another way to look at the outcome, and that is to study the size of the informal sector as a fraction of the *economy-wide* endowment of labor. Is it possible that this increases despite the assertion of the last paragraph? Interestingly enough, the answer is yes. Although the informal sector shrinks as a fraction of the urban labor force, it is also true that the overall size of the urban labor force has expanded. How do these two opposing effects play out?

Specifically, imagine that agriculture is in the Lewis phase, so that the wage in that sector remains at work subsistence z as fresh migrants move out of agriculture. In that case, the share of the informal sector in the total urban sector is unaltered (to see this, stare at (6.11) and (6.12), and use the fact that $w'_A = w_A = z$). But the entire urban sector has grown from the first equilibrium to the second. This must mean that *the informal sector has expanded relative to the economy as a whole* — a weird implication of a policy that was presumably aimed at *reducing* the size of that sector![78]

What accounts for this seeming paradox? How is it that a policy designed to absorb people *from* the informal sector ends up enlarging its size? As a matter of fact, there is no paradox at all, but an observation that we see repeated in one developing country after another. Attempts to increase the demand for labor in the formal sector may enlarge the size of the informal sector, as migrants respond to the better job conditions that are available. The migration effect may well dominate the initial "soak-up effect."

Similar "paradoxes" can be generated with regard to urban congestion, pollution, or the provision of health facilities. Policies aimed at directly reducing congestion (say, by building more roads) or pollution (say, by building a subway), or at increasing health (say, by building new public hospitals) might all have the unfortunate effect of finally worsening these indicators. In each case, the ultimate worsening occurs because fresh migration in response to the improved conditions ends up exacerbating the very conditions that the initial policy attempted to ameliorate.

[78] We note that this is not an inevitable outcome, especially when agricultural wages rise steeply after labor outmigration. But the very fact that it could happen in *some* salient situations is of sufficient interest.

6.10.2. Migration Restrictions. The forcible restriction of migration can reduce or even eliminate the urban informal sector. Policies under this umbrella range from internal registration systems (China, Vietnam, the erstwhile Soviet Union) to the physical removal of homeless individuals (the United States, most recently proposed for DC). Figure 17.8 depicts an extreme case in which no individual without a formal job can enter an urban zone. If such a policy can be enforced (and this is not a trivial issue), then this draconian measure certainly gets rid of the informal urban sector by definition, as it were. The number of people in the m-sector is now just $\bar{L}_m$; the remainder, $\underline{L}_a$, stay in the a-sector.

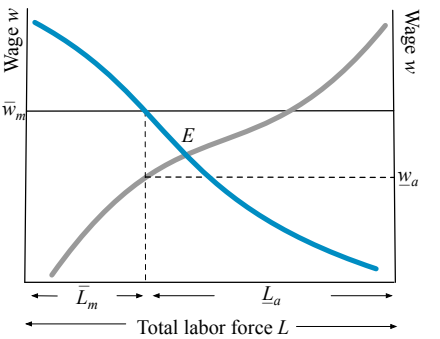


Figure 6.13. Migration Restrictions.

However, simply getting rid of the informal sector does not ensure an efficient outcome, even if we were to assume that the informal sector performs no useful social function. If the two labor demand curves depicted in Figure 6.13 come from profit-maximization, and the informal sector i has no value, an efficient outcome would be located where the two curves cross (E in the Figure), for that's the allocation which equalizes the value of the marginal product of labor across the two sectors a and m. It's not just a question of having labor in either a or m, with none in i. It's also a question of doing this in some sort of efficient way. We can do better than migration restrictions alone.

6.10.3. Wage Subsidies. A second policy is to offer a subsidy to employers in the formal sector for every unit of labor that they hire. Let us suppose that the subsidy involves financing σ dollars of the formal wage for every extra labor hour that is hired by a formal-sector employer. In this case the wage that is paid by the employer is effectively $\bar{w}_m - \sigma$, but of course the worker receives the full wage $\bar{w}_m$. That pushes out the demand for labor at the formal wage $\bar{w}_m$, as Figure 6.14 illustrates. In turn, that reduces L_a, driving up w_a. There is then a large enough subsidy, call it σ^*, so that w_a climbs to exactly equal $\bar{w}_m$. The resulting allocation is given by (L_m^*, L_a^*) in the Figure, with $L_m^* + L_a^* = L$, and the informal sector vanishes completely, just as it did with migration restrictions.

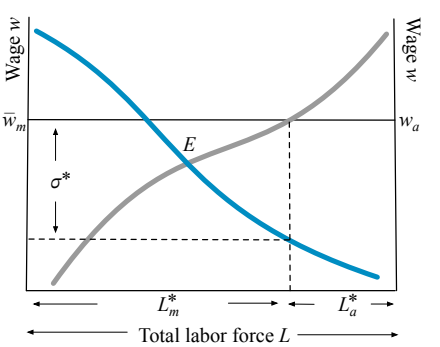


Figure 6.14. Formal Wage Subsidy.

How do the two policies compare on the efficiency front? The answer is unclear, but what *is* clear is that wage subsidies do not achieve full efficiency either. There is now *too much* labor in the urban sector relative to the efficient allocation (compare the subsidy allocation to E in Figure 6.14). In this sense, wage subsidies achieve exactly

the opposite of migration restrictions, even though both serve to eliminate the urban informal sector. Compare and contrast Figures 6.13 and 6.14.

6.10.4. A Combined Policy. The fact that the two policies discussed above fail to be efficient, but in "opposite ways," suggests the use of a mixed policy that combines migration restrictions with wage subsidies in the m-sector. Figure 6.15 illustrates this. The subsidy is carefully chosen to equal $\tilde{\sigma}$ so that formal labor demand is hiked up to precisely where the two demand curves cross. Note that workers still receive wage $\bar{w}_m$ in the m-sector, but only $\bar{w}_m - \tilde{\sigma}$ in the a-sector. Thus migration restrictions are still needed under this policy to make sure that the remaining labor force stays in the agricultural sector. In this way, a judiciously chosen combination of subsidies and migration restrictions can indeed achieve the efficient outcome.

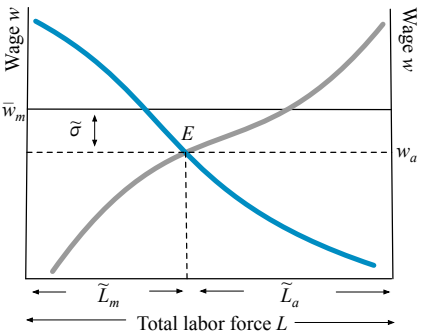


Figure 6.15. A Combined Policy.

6.10.5. Uniform Wage Subsidies. Are there efficient policies that can make do without migration restrictions? The answer is that there are and, oddly enough, they involve the subsidization of employment in agriculture *even though* agriculture has perfectly flexible wages to begin with. The argument that follows is based on Bhagwati and Srinivasan (1974). Consider a uniform subsidy of σ dollars per worker-hour to both agriculture and industry. The demand for labor in both sectors increases because the wage payouts in these sectors, from the viewpoint of the employer, are $\bar{w}_m - \sigma$ and $w_a - \sigma$ (instead of $\bar{w}_m$ and w_a). Workers, on the other hand, continue to compare the wages $\bar{w}_m$ and w_a. Because the informal sector shrinks, the expected urban wage must rise, and therefore, so must w_a. This process continues until the uniform subsidy reaches the level $\tilde{\sigma}$ at which formal labor demand climbs to the intersection of the two curves. At this point, the agricultural wage must have risen to precisely $\bar{w}_m$ as well! This is illustrated in Figure 6.16. The outcome is efficient as in the combination policy of the previous section, but in contrast, there is no need for migration restrictions, because the wages in the two sectors are perfectly equalized!

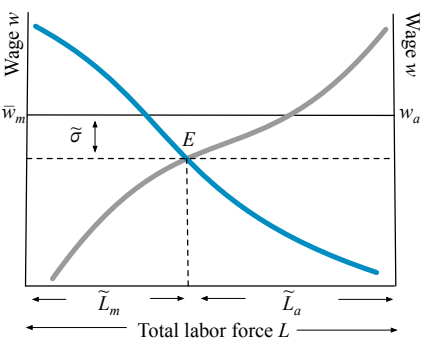


Figure 6.16. A Uniform Subsidy.

6.10.6. Postscript on Policy. Like its predecessor (Section 6.8), this Section studies different interventions in the a- and m-sector, the specific objective here being to avoid spillovers into an informal sector in as efficient a way as possible. Are the policies discussed here convincing in their scope and implementability? To answer this question necessitates that we step outside the rigid confines of our simple model and examine

the plausibility and robustness of its policy prescriptions. Several objections may be raised. We consider them one at a time.

A system of migration restrictions that work through registration and legal controls, such as *hukou* in China or *propiska* in the erstwhile Soviet Union, needs resources to monitor migration and verify residency. This is typically very hard to do, and if implementation is not perfect, it could exacerbate the problems of the informal sector instead of containing them. Moreover, if you review Figure 6.15, you will see that even if a registration system can be well-implemented, the efficacy of the combined policy relies crucially on getting the extent of migration restrictions right. Effectively, that means that the government would have to know the exact location of the demand curves in order to determine the size of the subsidy and the extent of migration restrictions. This is a tall order. Finally, physical restrictions invariably come with an upheaval in political unrest and a loss in legitimacy, especially if the burden of the restrictions are seen to fall disproportionately on certain ethnic groups (as in the case of South Africa's pass laws under apartheid).

That is why the uniform subsidy policy comes as a welcome substitute. It is also an interesting example of how simple economic theory can be used to reason through some unintuitive prescriptions — after all, at first glance there seems little to be gained by subsidizing wages in a sector that has flexible wages to begin with. And yet, that subsidy counters the need for legal migration restrictions. Is it a good counter, though?

This policy runs into one of the criticisms that we've already noted. It appears to rely on detailed knowledge of the economy. Revisit Figure 6.16. Solving for the exact value of the optimal uniform subsidy $\tilde{\sigma}$ appear to rely quite delicately on knowing the exact positions of the two labor demand curves. Fortunately, this criticism can be countered (Basu 1980). Suppose that the planner is heavy-handed with the subsidy and sets it too high at some $\sigma > \tilde{\sigma}$, where $\tilde{\sigma}$ is described in Figure 6.16. Will this destroy the desired allocation implemented by $\tilde{\sigma}$? Interestingly enough, the answer is no: all this does is push up both wages in a uniform way, so that the net wage (paid by employers) still settles at the level corresponding to the efficient allocation E. Figure 6.17 illustrates how the inadvertently larger subsidy is outweighed, dollar for dollar, by an increase in gross wage costs, so that the net effect is zero. In short, the uniform subsidy does not require a precise knowledge of economic parameters. Mistakes in the size of the subsidy, as long as they do not involve too *small* a subsidy, will wash out.

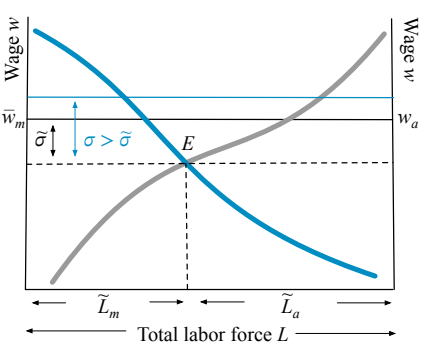


Figure 6.17. An Overly Generous Subsidy.

A separate criticism is that the subsidy is not free. It has to be financed from some source. Shouldn't the costs of financing be taken into account in determining the efficiency of the overall outcome? The answer is that it certainly should, but in principle, there is a way to make the entire policy self-financing: simply impose a

profits tax on firms and return the proceeds as a wage subsidy. The profit tax will form the revenue to implement the subsidy.

Now at first sight, this seems absurd. How is it that a policy that has no net effect on the combined balance sheets of firms nevertheless affects firm behavior? The answer is simple. The tax and the subsidy are conditioned on two *different* indicators of firm performance: profits and employment. Even though the two indicators cancel out when all is said and done, firm behavior can be altered substantially.

Our final criticism probably represents the single most important reason why a policy of wage subsidies is difficult to implement. It is that employment figures are often hard to verify. (And if the subsidy is paid for by profit taxes, the verifiability of profits enters the picture as well.) Without adequate verification, it is not possible to pay a subsidy based on employment to claim a tax on profits. It is not that such verification is impossible. But the costs of verification need to be factored into an assessment of overall efficiency of the migration policy.

6.11. Summary

This chapter studied *structural transformation* over the course of economic development. Our exposition was based on the perspective that development is rarely distributed in a balanced way across sectors; rather, it generates uneven outcomes, as resources move out of one sector to fuel the growth of another. Much of the analysis works for any two sectors — we called them *archaic* and *modern*.

Initially, we merely introduce this somewhat abstract high-level viewpoint (Sections 6.2 and 6.3.1). After all, the story of structural transformation applies to various shifts — from agriculture to manufacturing, from manufacturing to services, from human computation to the IT and digital era, from white-collar employment to the rise of AI-based alternatives, from manual labor to robotics. However, by far the most important structural transformation in history is the change from a predominantly rural economy to an industrial economy. It has special aspects that we chose to highlight; in particular, that it is imperative to have a minimum supply of basic goods for work subsistence as the agriculture-manufacturing transformation proceeds. Non-homothetic preferences also play a special role, as the economy becomes richer and moves away from predominantly food consumption, thereby imparting specific directionality to the transformation. Finally, we described how a dysfunctional structural transformation might occur as a byproduct of too-few employment opportunities in the modern sector, leading to the birth and growth of an entire informal sector, often based on services.

We discussed different frameworks circling these central issues. We began with the *Lewis model* (Section 6.4), epitomized by the phrase “economic development with unlimited supplies of labor." Development is characterized by an ongoing move of labor and resources from a “traditional" sector’ to a “modern" sector. Ongoing capital accumulation in the modern sector provides the fuel for sustained labor transfers. Lewis argued that the traditional sector is characterized by *surplus labor* (a situation in which labor can be removed without loss in output). Under this view, industrial development can then proceed without impediment as long as savings rates and modern capital accumulation are high, at least until the surplus-labor phase comes to an end.

But the Lewis model is inadequate on two counts. First, it presumes that labor in the traditional sector is perfectly exchangeable with labor in the modern sector. So in the

surplus labor phase, labor is supplied with infinite elasticity to the modern sector. That presumption is discarded in the variant of structural transformation due to Kuznets (Section 6.5). Under the Kuznets view, skill sets are different across the two sectors, so that even in the Lewis surplus labor phase, the wage rate in the modern sector initially jumps up as the transformation proceeds. A wage differential opens up across the two sectors, one that takes time to attenuate as individuals engage in occupational choice. That choice will be studied in more detail later in the book, but for now it suffices to note that structural transformation involves widening inequalities in its initial stages, followed by a compensatory phase in which the wage differential falls as individuals acquire sector-specific skills. That leads to a path in which inequality first rises and then falls over the course of development — a phenomenon later christened the *inverted-U* hypothesis. (This contrasts with the smooth transition envisaged by Lewis.) Indeed, every structural transformation, not just agriculture to industry, can be accompanied by its own uneven and compensatory phases.

The second count on which the Lewis model might be inadequate is that it neglects the importance of work subsistence — the provision of basic needs for productive employment — over and above survival subsistence. This underlies what we called the Kalecki-Rao constraint: the need to have an adequate *domestic* surplus of basic goods to shore up the employment of non-agrarian workers. The constraint acquires particular salience in a closed economy, in which food imports cannot freely substitute for the domestic constraint. Food is special: governments often desire self-sufficiency in it for political or strategic reasons. We might *wish* that countries did not behave in this way (this chapter would certainly have been much shorter), but the importance of domestically produced basic needs is paramount. And so are its implications: even if labor is fully exchangeable across sectors, technical progress or capital accumulation in the modern sector leads to zero job creation, as industrial wages rise relative to industrial prices. Ongoing structural transformation rests on the creation of a larger agrarian surplus, which necessitates investment in agriculture.

The Kalecki-Rao framework brings out a fundamental tension between agricultural and industrial development: industrialists like to keep agricultural prices low, because that ensures a low wage bill. On the other hand, a policy that keeps agricultural prices low has disincentive effects on agriculture and can strangle industrial development in the longer run. This observation leads to the question: how should a government that is interested in promoting industry deal with agriculture? Should it tax or collectivize agriculture as much as possible, thus ensuring a large food surplus in the short to medium run, or should it invest in agriculture and look to possible long-run gains? The great debate that took place in the Soviet Union in the 1920s is still relevant today.

Related to agricultural taxation is the question of agricultural *pricing policy*: price support programs, subsidies to inputs such as water, electricity, and fertilizer, and (international) exchange rate policy. There is evidence from China and other countries that agricultural output reacts strongly to price incentives, and this suggests that a more liberal attitude to food prices in the short run may pay off in the longer run.

We moved on to the *Harris-Todaro* model (Section 6.9), in which the growth of a large informal sector could be the dysfunctional consequence of larger labor migrations to a formal sector with inadequate job opportunities. Why does the migration happen nevertheless? Harris and Todaro proposed a view of migration in which the formal

sector is characterized by an excess supply of labor, with the excess spilling over into an informal urban sector or even open unemployment. It isn't *actual* wages that are equalized across sectors, but the *expectation* of wages: specifically, the average of various urban wages *weighted by the probability of employment in formal and informal sectors* is equal to the agricultural wage.

We then examined how different policies might affect the the size of the urban informal sector. We studied a paradoxical outcome in which an expansion of formal employment leads to an enlargement of the informal sector as fresh migrants from the rural sector swarm into the urban sector in response to the policy. Finally, policies that move the economy toward an efficient labor allocation were also considered: among them, *migration restrictions*, *wage subsidies* as well as combinations of the two.

Appendix

In the Appendix, we follow up some of the analysis with some formal reasoning. None of it is hard, so do read this to gain a deeper understanding of the material.

Lewis-Kuznets. We presume that the modern sector is characterized by profit-maximizing production, with profits (inclusive of returns to capital) given by

$$pY_m - w_m L_m = pMK_m^{\mu} L_m^{1-\mu} - w_m L_m, \tag{6.13}$$

where p is the price of modern output and w_m is the market wage, both expressed in units of the archaic output. Entrepreneurs choose labor L_m to maximize these profits, which means that labor is hired up to the point where the value of its marginal product equals the wage, or equivalently (by a little calculus):

$$pM(1-\mu)K_m^{\mu} L_m^{-\mu} = w_m.$$

Moving terms around, we obtain a formula for the employment of modern labor, *given* the capital stock in the modern sector:

$$L_m = \left[\frac{Mp(1-\mu)}{w_m}\right]^{1/\mu} K_m. \tag{6.14}$$

Complicated? Not at all. The terms within the brackets contain parameters that affect labor demand in obvious ways. For instance, higher TFP M will raise labor demand, and a higher value of the wage w_m or a smaller output price p, will lower labor demand. When these terms remain constant, *modern employment expands in proportion to modern capital*. All these are basic properties that rely only on constant returns to scale, though our Cobb-Douglas formulation lets us write down specific formulae in closed form.

Substituting optimal L_m from (6.14) into (6.13), we see that:

$$\begin{aligned} m\text{-Profits} &= pMK_m^{\mu} L_m^{1-\mu} - w_m L_m \qquad (6.15)\\ &= pMK_m^{\mu}\left[\frac{Mp(1-\mu)}{w_m}\right]^{(1-\mu)/\mu} K_m^{1-\mu} - w_m\left[\frac{Mp(1-\mu)}{w_m}\right]^{1/\mu} K_m \\ &= \underbrace{\left[\frac{\mu M^{1/\mu} p^{1/\mu}(1-\mu)^{(1-\mu)/\mu}}{w_m^{(1-\mu)/\mu}}\right]}_{B} K_m. \qquad (6.16) \end{aligned}$$

Equation (6.16) replicates equation (6.5) in the main text for a Cobb-Douglas production function.

In the Lewis phase, w_m equals work subsistence z, and so an expansion in K_m proportionately pulls up labor, which is why in Lewis's view, the central development problem — essentially, the *only* problem — is to ensure that "voluntary saving is running at about 12 to 15 per cent of national income or more."

Kalecki-Rao. In the Kalecki-Rao setting, matters are more complicated even when the economy is in the Lewis phase. The very expansion of capital K_m affects the wage w_m in the short-term, which raises w_m/p and slows down structural transformation by restricting the expansion L_m; see (6.14). Over the longer haul, as workers acquire modern skills, spurred on by the wage gap $w_m - w_a$, more labor enters the m-sector. You might think of the Lewis model as describing this longer-run movement once the occupational choice process has the opportunity to fully play out.

Next, we define the Kalecki-Rao constraint. If we presume that the a-sector is driven by profit maximization (not at all central to the argument, but it cuts down on the different cases), then L_a is determined by an equation analogous to (6.14):

$$L_a = \left[\frac{A(1-\alpha)}{w_a}\right]^{1/\alpha} K_a, \tag{6.17}$$

and substituting (6.17) into the a-sector production function (6.1), we see that:

$$Y_a = AK_a^{\alpha}L_a^{1-\alpha} = A^{\frac{1}{\alpha}}\left[\frac{1-\alpha}{w_a}\right]^{\frac{1-\alpha}{\alpha}} K_a.$$

where we use (6.1) to pin down L_a. The Kalecki-Rao constraint in equation (6.7) can then be rewritten as:

$$A^{\frac{1}{\alpha}}\left[\frac{1-\alpha}{w_a}\right]^{\frac{1-\alpha}{\alpha}} K_a = z(L_a + L_m) \tag{6.18}$$

Putting these arguments together, we have a succinct description: *either* the labor force L is so large that

$$zL \geqslant A^{1/\alpha}\left[\frac{1-\alpha}{z}\right]^{\frac{1-\alpha}{\alpha}} K_a, \tag{6.19}$$

in which case the wage rate settles at work subsistence ($w = z$) and employment $L_a + L_m$ is pinned down by equation (6.7) (with w_a set equal to z), *or*

$$zL < A^{1/\alpha}\left[\frac{1-\alpha}{z}\right]^{\frac{1-\alpha}{\alpha}} K_a, \tag{6.20}$$

in which case the wage $w > z$ solves $zL = A^{1/\alpha}\left[\frac{1-\alpha}{w}\right]^{\frac{1-\alpha}{\alpha}K_a}$, and $L_a + L_m = L$.

Why a change in manufacturing capital K_m or TFP M has no effect on L_m or L_a:

Either (6.19) is true, or (6.20) is true. In the former case, $L_a + L_m$ is determined by (6.18) (with $w_a = z$). In the latter, $L_a + L_m = L$. Moreover, L_a is determined by (6.17). Therefore in either case, L_m is fully pinned down and is independent of K_m or M.

Why higher K_a or TFP A increases both L_m and L_a in the surplus labor phase:

In the surplus labor phase, wages equal z. Rewrite equation (6.18) so that

$$zL_m = A^{\frac{1}{\alpha}}\left[\frac{1-\alpha}{w_a}\right]^{\frac{1-\alpha}{\alpha}} K_a - zL_a.$$

Substitute in the value of L_a from equation (6.17) and simplify to obtain

$$zL_m = A^{\frac{1}{\alpha}}\left[\frac{1-\alpha}{w_a}\right]^{\frac{1-\alpha}{\alpha}}\left[1-\frac{z}{w_a}(1-\alpha)\right]K_a = A^{\frac{1}{\alpha}}\left[\frac{1-\alpha}{z}\right]^{\frac{1-\alpha}{\alpha}}\alpha K_a, \tag{6.21}$$

where we've used $w_a = z$ in the last equality. It should be clear from (6.21) that L_m goes up with K_a or A. Recalling (6.17) with $w_a = z$, we see that L_a goes up as well.

Here is a variation on the discussion of premature modernization in the main text. Our analysis presumed that there is profit maximization in agriculture, with profits accruing to landowners who have already taken care of their subsistence needs. If agrarian production is organized more cooperatively, it avoids premature modernization. To understand this, assume that all land is held equally by agrarian families, and with output divided equally. Now labor income equals average product, which is given by equation (6.4) in the main text and reproduced here:

$$\tilde{w}_a = \frac{\tilde{Y}_a}{\tilde{L}_a} = AK_a^{\alpha}\tilde{L}_a^{-\alpha}.$$

where we have put tildes on the relevant endogenous variables so as not to confuse them with the profit-maximizing case. We know that $\tilde{w}_a$ must be at least z for every working person. Poor societies with a small endowment of K_a (or A) will be unable to gainfully absorb every member of the labor force L — some will be at survival subsistence below z, and $\tilde{L}_a$ will settle at a level below L, given by the condition

$$\tilde{w}_a = AK_a^{\alpha}\tilde{L}_a^{-\alpha} = z, \text{ or } \tilde{L}_a = \left(\frac{A}{z}\right)^{\frac{1}{\alpha}} K_a. \tag{6.22}$$

This will result in unequal treatment within the family as they cannot afford to feed everyone at work capacity.[79] It's the analogue of the profit maximizing setting in which some individuals are left unemployed. Moreover, the m-sector will be nonexistent. But here is the important point: there is still more employment — more individuals at work subsistence — with family farms, than under profit maximization with both agriculture and industry *combined*. To see this compare the formula for $\tilde{L}_a$ in (6.22) with the corresponding formula for $L_a + L_m$ in (6.18) under profit maximization, and in the surplus labor phase:

$$L_a + L_m = \frac{1}{z}A^{\frac{1}{\alpha}}\left[\frac{1-\alpha}{w_a}\right]^{\frac{1-\alpha}{\alpha}} K_a = \frac{1}{z}\left(\frac{1}{z}\right)^{\frac{1-\alpha}{\alpha}} A^{\frac{1}{\alpha}}(1-\alpha)^{\frac{1-\alpha}{\alpha}} K_a = \left(\frac{A}{z}\right)^{\frac{1}{\alpha}}(1-\alpha)^{\frac{1-\alpha}{\alpha}} K_a,$$

where we've used $w_a = z$ to manipulate the formula and arrive at the last equality. Because $(1-\alpha)^{\frac{1-\alpha}{\alpha}} < 1$, it follows that $L_a + L_m < \tilde{L}_a$.

Agrarian income sharing will release no surplus to any other activity until the entire labor force can be sustained at a minimum of z. It therefore avoids premature modernization, because all surplus is used for subsistence purposes until that subsistence is met. This is the protection afforded by the equality of land ownership. It comes at the cost of delaying the structural transformation. As discussed before, we could

[79] For a discussion of how poverty can generate unequal within-family treatment, see Mirrlees (1976).

disagree on the welfare implications, but your author has no hesitation in declaring that universal work subsistence comes first.

Once that subsistence is met, the remainder of the analysis proceeds as before. Each family farm is now in a position to market an agrarian surplus. The greater that surplus, the larger will be the amount of manufacturing employment. An improvement in the manufacturing technology alone, or capital accumulation in that sector alone, will have no impact on labor allocation between manufacturing and agriculture. The release of labor to manufacturing can only come about via an increase in agrarian productivity.

In summary, an egalitarian distribution of land in agriculture eliminates the premature development of a manufacturing sector, while all other insights pertaining to the *growth* of that sector remain fundamentally unaltered. The greater is agrarian inequality, the earlier is the start of structural transformation, though as discussed, not necessarily for reasons of the social good.