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Economic Development in the 21st Century

by

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Abstract

The goal of economic development is to raise standards of living in LDCs, to be achieved by accumulating both human and non-human capital so as to maximize production net of the cost of these investments. An LDC economy is modelled with two sectors, modern and traditional, each of which uses its own type of human and non-human capital in production. Sector-specific human capital is specified as an attribute embodied in its workers, who have agency to choose their sector of employment and level of education. Earnings of labor are the sum of two components: recovery of human capital investment costs (e.g., student loan repayments) and an economic rent (i.e., profit) available for current consumption. The consumption-maximizing resource allocation equalizes rates of return to investments in all types of capital and allocates workers between the two sectors so that labor rents (i.e. consumption levels) are the same in both. Policy implications emphasize removing economic, social and cultural barriers to economic mobility for all resources.

Keywords: Economic development, growth, human capital, LDCs, labor rents

JEL codes: I25, I26, J21, J24, O00, O15, O41

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Economic Development in the 21st Century

I. Overview

The model presented in this paper takes a classical approach to the problem of economic development, envisioning the typical LDC (i.e., less-developed country) as having a dual economy, with one sector of production using high-productivity “modern” technology and the other using low-productivity “traditional” technology. In this respect it builds on the standard development model introduced in mid-20th century. (Lewis 1953) It updates that model, however, in light of improvements in traditional-sector data and the economic policy experiences of the past seven decades.¹ It also incorporates dramatic theoretical advances in labor economics during the second half of the 20th century by treating human capital investments as an integral part of the development process. These modifications shift the emphasis from production to consumption as the ultimate policy goal, clarify the relationship between human and nonhuman capital, and permit workers’ preferences to play a role in between-sector resource allocation.

Background

In the early 1950s, recent experience with successful economic growth policy was exemplified by the Marshall Plan, an American policy that focused on replacing (and thereby updating) physical capital in Europe and Japan that had been devastated by the destruction in World War II. The ultimate goal was to build production capacity, and the Marshall Plan had

¹ In the early 1950s Lewis had little or no data, statistical or otherwise, for the traditional sector, so he made informed assumptions based mostly on anecdotal evidence or “casual empiricism.” Largely because his model stimulated interest in that sector, today we have both survey data and non-quantitative evidence that cause us to question some of those assumptions. In fact, however, most of the criticisms that have made the so-called “Lewis Model” obsolete are directed at his assumptions and do not undermine his basic classical approach to the problem.

achieved this by financing investments in non-human capital to “create” jobs for a displaced workforce that subsequently became employed middle-class consumers. Economists and policy-makers thought that this same approach could be adopted to improve living conditions in the non-modern economies of LDCs.

Since modern technology held the promise of dramatic increases in LDC labor productivity, it seemed obvious that expanding productive capacity in a high-wage modern sector would draw unemployed (or underemployed) labor from the low-productivity non-modern sector and eventually solve the poverty problem by shrinking the traditional sector. This would be achieved by investing in the modern sector – that is, by augmenting the non-human capital that embodied modern technology – and became the basic approach to economic development policy for the next half century.

In retrospect, policies influenced by this model were often unsuccessful because they were based on faulty assumptions: about the economics of a traditional sector, about the productivity of human as well as physical capital, about the way labor markets would work, about the universal desirability of modern technology, and about the administrative capabilities of LDC governments. They kept the classical assumption of class distinctions based on whether income was derived from interest (i.e., capital ownership) or wages for work performed (i.e., labor), although it was already clear by mid-century that this boundary had blurred and social distinctions based on education were becoming much more important.

Lewis’ “trickle-down” theory of economic development was soon countered by a “grass-roots” theory that said that if poverty-alleviation is the goal, then resources should be made available to raise traditional-sector productivity. By the 1970s, focus was shifting from industrialization *per se* to improvements in living standards as the primary development goal -- that is, from aggregate economic growth to “income distribution.”

Motivation

An important advantage we have over our predecessors in the early 1950s is that three quarters of a century worth of LDC economic history has been playing out since then. We know now, for example, that the so-called “Traditional” sector is not necessarily stagnant, using the same technology mindlessly for centuries on end regardless of potential improvements, but is capable of responding to changes in economic incentives. Although a few critics of Lewis’s theory pointed this out very early (Schultz, 1962; Sen, 1966), most of the literature on economic development (and the policies that it inspired) accepted this view. It was only decades later, when “traditional” farmers gained access to roads, electricity, motor vehicles, and modern communication (phones, radio & TV, internet) that we observed them as responsive to changing incentives. For lack of a better term, however, we still label the non-modern sector as “Traditional,” even though we now better appreciate its internal dynamism.

Another important advantage that today’s economists have over Lewis and his contemporaries is the emergence and growing sophistication of “Modern Labor Economics.” It would be little more than a decade after the appearance of Lewis’ model of LDC development that labor economics would be transformed by a new focus on the supply side of the market for human capital. (Becker 1964, Becker and Chiswick 1966). This “new” approach to labor economics considers the worker’s perspective rather than that of the firm, taking as its point of departure the implication of embodying that factor in people rather than firms. If workers “own” the human capital embodied in them, they have an incentive to invest in their own skills motivated primarily by the private rate of return to that investment. Within a few decades this perspective came to dominate explanations of supply conditions for human capital.

Lewis may not yet have been aware of Becker's early work exploring the supply side of human capital factor markets. The decades since then have seen a virtual revolution in our approach to labor market analyses as well as a remarkable expansion of empirical applications of human capital theory. Without this perspective, Lewis can be forgiven for following classical precedents, specifying aggregate labor as time working (e.g., days or man-hours) and the only labor input in his model. With today's "new" labor economics, however, we need to incorporate human capital in both the demand and supply sides of the factor market.

Approach

The model presented in this paper focusses on standards of living by maximizing aggregate consumption rather than production. It incorporates human capital theory in its specification of both sides of the labor market, supply as well as demand. It adapts earlier models of development to the economic environment of the 21st century by assuming that all increases in capital – whether human or non-human – must be justified by profitability and paid for out of those profits. It also improves on earlier models by incorporating more realistic assumptions about the non-modern sector, and by not privileging *a priori* either sector of the economy over the other. As a result, it provides a new framework for understanding development, income distribution, and growth policy in today's LDC economies.

Part II begins by updating assumptions underlying production functions for the two sectors, with an emphasis on their implications for factor demands. Part III focusses on investments in human capital, both the "amount" that each individual acquires (i.e., the intensive margin) and the reallocation of workers between sectors (the extensive margin). Part IV summarizes the implications of these revisions for income distribution and improvements in the

standard of living in today's LDCs. Part V concludes with a look toward the future of economic development within the framework of the model developed here.

II. Production Functions and Factor Demand

A. Rethinking Basic Assumptions

The early 1950s was a transition period when European colonies in Asia and Africa were becoming independent countries with a relatively small (and often expatriate) modern sector and a correspondingly weak domestic economy. At the time when Lewis was thinking about economic development in Third World countries, it was believed that modern-sector technology could improve LDC resource use so much that everyone would benefit from higher standards of living. Most economists at that time assumed that the depth of poverty meant very low LDC savings rates so that any major investments in non-human capital would have to come from external sources – former colonial powers, bilateral foreign aid programs, international organizations, as well as the deep pockets of a few modern-sector capital owners. Together with their assumption that the marginal productivity of labor in the traditional sector was at best negligible, this meant that the modern-sector production could be expanded at virtually no cost to the domestic economy – the so-called “trickle-down” theory of development.

Although these assumptions seemed reasonable in the world of 1950, they have long since ceased to be useful. Empirical studies of production in the traditional sector, whether based on statistical data or qualitative evidence, have shown convincingly that while labor productivity may be low it is not negligible. In addition, LDC governments have been financing their investments either domestically or with the help of foreign sources concerned with the cost-effectiveness of the projects. Incorporating investment costs into our analysis of economic

development implies two important changes in the specification of development goals. First, it means that we want to maximize production *net* of these costs – by definition, that means maximizing aggregate consumption rather than aggregate output. Second, it implies neutrality with respect to where the investments should go instead of privileging the modern sector.

Capital should be accumulated in the form that is most profitable; if a traditional-sector project is sufficiently cost-effective so that it has a larger rate of return than one in the modern sector, then that is where investment should go. This is the economic principle underpinning the “grass-roots” approach to development policy.

B. Rethinking Production Functions

Both human and non-human capital may be treated as sector-specific inputs, with non-human capital denoted K_M and K_T for modern and traditional sectors, respectively, and human capital denoted H_M and H_T . Since the two sectors are differentiated by their use of different technology systems, they also have different production functions, f and g respectively:

$$Y_M = f(H_M, K_M) \quad \text{and} \quad Y_T = g(H_T, K_T) \quad (1)$$

As long as aggregate output is conventionally measured in monetary units, aggregate production for the economy as a whole is simply the sum of the output in both sectors:

$$Y \equiv (Y_M + Y_T) = f + g \quad (2)$$

Each type of capital is obtained in a market for which the demand curve is the value of its marginal product. The demand for human capital is thus $f_H(H_M, K_M)$ in the modern sector and $g_H(H_T, K_T)$ in the traditional sector, and similarly the demand curves for non-human capital are f_K and g_K in the two sectors.

1. The Market for Non-Human Capital

The only deviation from convention in this paper with respect to non-human capital K is an insistence that it does not include any form of human capital. One efficiency unit of non-

human capital is assumed to be worth exactly one dollar (or other relevant currency), an arbitrary unit chosen as *numeraire* for convenience in calculations. Dollars can be borrowed at an interest rate of r per year regardless of the “shape” of the resulting capital stock, so the annual repayment of such a loan would be rK for the economy as a whole, allocated between the two sectors by rK_M for the modern sector, rK_T for the traditional sector, so that

$$rK = r(K_M + K_T) \quad (7)$$

For simplicity, we assume that an LDC is a price-taker in international financial markets so that r is effectively constant across sectors and regardless of the amount borrowed. Also for simplicity, we assume a rental market for equipment that is in equilibrium so that the interest rate r is also the rental rate of an efficiency unit of K .

2. *Labor Demand*

Aggregate labor inputs are conventionally measured in units of time (e.g., years, days, or man-hours) allocated between the two sectors according to:

$$L = L_M + L_T \quad (3)$$

where L is the total size of the labor force. Workers receive wage rate w_M per unit of time for modern-sector workers and w_T for traditional-sector workers, each broadly defined to include salaries and imputed non-monetary earnings. If w denotes the average wage per worker, the wage bill for the labor force as a whole is:

$$wL = (w_M L_M + w_T L_T) \quad (4)$$

Efficiency units of human capital can be acquired only by hiring the workers in whom they are embodied, so the wage bill is the cost of using human capital in the production process.²

² The demand for labor is derived by firms who view aggregate human capital (H) as analogous to non-human capital (K), but the investment markets that determine supply for these two factors are very different. The “new labor economics” focuses on the supply side of the

If v_M denotes the price of an efficiency unit of modern-sector human capital H_M , the total annual cost of using this input is the modern-sector wage bill, and similarly for the traditional sector:

$$v_M H_M \equiv w_M L_M \quad \text{and} \quad v_T H_T \equiv w_T L_T \quad (5)$$

Although people (i.e., L) are measured in units of time that are commensurable between sectors, the efficiency units of human capital (i.e., H) are sector-specific and so cannot be simply added together to get an economy-wide aggregate. The relationships between the factors of production H and the workers L in whom they are embodied are given by sector-specific human-capital-labor ratios h :

$$H_M / L_M \equiv h_M \quad \text{and} \quad H_T / L_T \equiv h_T \quad (6a)$$

Equivalently, the wage rate in each sector is simply the average number of efficiency units per worker valued at the market price per unit.³

$$w_M \equiv v_M h_M \quad \text{and} \quad w_T \equiv v_T h_T \quad (6b)$$

3. *Historical Aside*

The notion of Human Capital was just emerging as Lewis was preparing his paper on economic development in LDCs. Economic historians would calculate the rate of growth of aggregate production in the U.S. as a function of the rates of growth of capital and labor, an exercise known as “growth-accounting,” and discover a large unexplained “residual” that pointed

market for human capital, giving agency to workers (and their funders) to choose the amount and/or type of skill to acquire. Whether viewed from the perspective of the firm or that of the worker, however, the essential nature of human capital is that it is embodied in, and inalienable from, the individual worker. The implications of this for economic development policy are obscured by the common practice of separating human capital from workers by treating it as though it were just another form of non-human capital.

³ In the literature on Labor Economics the average amount of human capital per worker is often called labor “quality.” Here we prefer the more neutral-sounding notion of efficiency units per worker, both to avoid invidious nuances for viewing workers as “low quality” and also to emphasize the analogy between capital/labor ratios for different types of capital.

to an omitted input. (Denison, 1962) The growth of education – sometimes referred to as labor “quality” – was suggested as a third factor of production in order to “explain” this residual. Although some models specify labor quality as a factor in its own right, it seems more natural to think of it as a characteristic of workers since by definition it is embodied in and inalienable from them. The model developed here achieves this with the human-capital/labor ratios, h_M and h_T in equations (6a) and (6b), measured as sector-specific efficiency units per worker.

At about the same time, attempts to integrate modern technology into LDC economies were being hampered by shortages of workers with the skills to operate and maintain modern machinery. This gave rise to the notion of “manpower development,” whereby workers would receive training for the “needs” of specific production processes. (Harbison & Myers, 1964) In this perspective, non-human capital generated jobs for workers rather than serving as tools that enhanced worker productivity. It thus seemed that the full cost of modernization had to include not only machines but also training workers, suggesting that the two could be combined as the total cost of investment.

In this spirit Lewis, like most of his contemporaries and many economists even today, simply included human capital along with non-human capital into a single aggregate “K” factor of production.⁴ This has the unfortunate consequence of obscuring the role of skills as a determinant of wage rates and hence income distribution. It also prevents any analysis of social class differences based on education. The model developed here avoids the pitfall of separating workers from their skills, a theme that will be expanded in some depth in the sections below.

⁴ Unfortunately, policy makers rarely recall this assumption when allocating investments. Education budgets are typically independent of budgets for economic development, and *vice versa*.

4. *Labor Supply*

The supply of human capital is determined in a market for investment which also requires active participation by the people in whom the capital is to be embodied. This market will be examined in more detail later in this paper. Leaving aside the role of experience and on-the-job training in human capital investments, workers typically enter the labor market with skills already formed (an assumption that can be relaxed later with no effect on the substantive conclusions of this paper). Not only are these skills embodied in the workers themselves, but their supply is determined primarily by investments made by those same workers (and their families or donors) rather than by the firms that hire them.⁵ For both of these reasons, human capital appears in the production function as an attribute of labor rather than just another form of non-human capital.

III. Investment in Labor Supplies (Human Capital)

The original two-sector model of economic development in LDCs assumes that all increases in modern-sector labor inputs come on the extensive margin – that is, by hiring more workers. The modern sector could expand only by drawing workers out of the traditional sector or from the ranks of the unemployed, and the traditional sector could compensate for any loss of workers by drawing workers from a pool of underemployed subsistence labor (including women and children). In contrast, modern labor supply theory focusses primarily on investments on the intensive margin of labor supply, giving rise to markets for education (broadly defined to include schooling, job training, and other methods of learning) that have very different characteristics

⁵ Although on-the-job training may appear to be financed by employers, it is typically financed by wage reductions either fully (for general skills that are transferable between firms) or partially (for firm-specific skills). (Becker 1964).

than those of an investment market for physical capital. It is to those markets that we now turn our attention.

A. The Intensive Margin: How much skill to acquire?

Education is the investment process whereby time and money are combined to produce human capital. The output of that process is embodied in – and inalienable from – a student, and by its very nature requires the student’s time and effort as a major input. The amount of human capital formed increases with every unit of a student’s time (e.g., month or year); its marginal product increases but at a diminishing rate and this rate may even become negative at some point. (This is why schooling, training, and most other forms of education eventually come to an end.) In effect, the educational process has a conventionally shaped production function and hence an associated conventionally shaped cost function.

1. Cost Functions for Education

A person’s demand for work-related education depends on the extent to which it will lead to a higher wage relative to the cost of acquiring new skills. The marginal product of a dollar’s worth of education – the skills obtained by an additional investment on the intensive margin – may be high in some range of schooling levels, but at some point skill formation is subject to both diminishing marginal product and increasing value of the time required for investment. Students, apprentices, interns, or anyone else investing in skill-formation face a conventional production function for acquiring skills, and hence a cost curve, in the range relevant for decision-making.

Consider an educational production function where each dollar invested generates additional units of skill. Let $C(h)$ denote the total cost of acquiring h units of skill measured in sector-appropriate efficiency units. (For ease of exposition, sector subscripts M and T will be

implicit for the time being.) At some point in the educational process, the value of additional dollars begins to decline or, equivalently, it takes more dollars to achieve the same increment in skill level. That is, the marginal cost curve $C'(h) > 0$ has a positive slope and $C''(h) > 0$. The average cost curve $c(h) \equiv C/h$ is a U-shaped function of h and the marginal cost curve crosses the average cost curve from below at its minimum.

Since the benefits of acquiring h continue from one time period to the next, the current-period portion of total, average, and marginal costs can be written as rC , rc , and rC' , respectively, where r is the interest cost of each investment dollar.⁶ A worker's supply curve for quality units is that portion of $rC'(h)$ at or above the minimum of the U-shaped average cost curve $rc(h)$. As long as he or she is a price-taker in the labor market and the market price per efficiency unit is exogenous at v^* , then the optimal level of investment in skills should be $C(h^*)$ where $rC'(h^*) = v^*$.

These relationships hold regardless of whether the skills are formed in school, on the job, or in an informal setting – in each case, raising one's skill level involves an education production function with marginal costs and marginal benefits. They also hold regardless of how the skills are financed, whether by the worker before being hired or by the employer afterwards.⁷ Finally, they hold regardless of type of efficiency units. The traditional sector uses skills measured in its

⁶ For example, if $C(h)$ was borrowed in the past for an additional year of schooling, rC would be the annual loan repayment required in subsequent years.

⁷ The efficiency-wage literature defines this same relationship in terms of productivity, positing that a worker's productivity h is positively related to the wage v per efficiency unit and analyzing this relationship as a "productivity curve" (Stiglitz 1976). It is easy to show that this "productivity" curve is simply the inverse of a cost curve $C(h)$. An "efficiency wage" is defined as the price v at which the average product of an efficiency unit h is equal to its marginal product or, equivalently, where $C' = c$. The "efficiency wage" is thus the lowest price that can clear the market for h because it just covers the cost of skill-formation without any additional rent paid to the worker. (For a full development of this issue see C. Chiswick 1986.)

own efficiency units, H_T , with its own production function and hence cost curves, but if v_T^* is the market price of those efficiency units then the optimal level of investment in traditional skills should be $C(h_T^*)$ where $rC'(h_T^*) = v_T^*$.

2. *Demand and the Market for Efficiency units*

The supply of skills h per worker is the upward-sloping curve rC' for each sector, the current-period portion of marginal cost. The demand for skill per worker is the marginal product of an additional unit of skill on the intensive margin, derived from equation (1) as $MPh_M = L_M f_H(h_M)$ for the modern sector and $MPh_T = L_T g_H(h_T)$ for the traditional sector. The downward-sloping curves f_H and g_H are the derived demand for skill levels per worker, and employing workers with higher skill levels is profitable only as long as $f_H \geq v_M$ and $g_H \geq v_T$. Equilibrium in the market for h occurs at price v^* and quantity h^* , where marginal cost and marginal product are equal:

$$f_H(h_M^*) = r C'(h_M^*) = v_M^* \quad \text{and} \quad g_H(h_T^*) = r C_T'(h_T^*) = v_T^*. \quad (8)$$

A worker's wage, w^* , is simply the rental value of his or her human capital, v^*h^* .

The market for either type of efficiency unit can be illustrated by the graph in [Figure 1](#). Equilibrium is reached at h^* where supply equals demand. The wage earned by each worker is $w^* = v^*h^*$, illustrated in Figure 1 as the shaded areas determined by the equilibrium price v^* . This area is divided into two components. The first, the lightly shaded area, is $rC(h^*) = h^*rc(h^*)$, is the current-period portion of the total cost of attaining skill level h^* . This portion of the wage is required for repayment of debt, whether to others or to oneself, and is not available for current consumption. Suppose prior human capital investments were financed by the worker, whether by borrowing at interest rate r or by accepting a lower wage from the employer. In either case,

the worker pays $rC(h^*)$, the current-period cost of prior investments. The darker shaded area is the earnings net of this debt. For a profitable investment, this net wage,

$$w(h^*) - rC(h^*) = h^* (v - rc) = rh^*(C' - c) \geq 0 \quad (9)$$

is a measure of current consumption possibilities and thus an indicator of the worker's welfare. (From the last term in equation (9), the sign of the net wage is determined by the difference between marginal and average cost at h^* .)

The net wage described in equation (9) may also be interpreted as an economic rent earned by the worker *per se* in addition to the return on his or her investment in human capital. It arises because human capital cannot exist without being embodied in a worker, because using human capital in a production process requires voluntary cooperation by the worker, and because raising each worker's skill level is subject to diminishing marginal product. As we shall see below, it is also the price of labor on the extensive margin. Distinguishing between the two shaded areas in Figure (2) captures the fact that a worker is more than just the human capital embodied in himself or herself and must be valued accordingly.

B. The Extensive Margin: What type of skill to acquire?

[Figure 2](#) illustrates an economy in which skill-creation (i.e., investment) processes are very different for the two skills. Traditional efficiency units are relatively easy to acquire in a short amount of time, so diminishing marginal product sets in quickly making its cost function relatively inelastic. Modern human capital is more expensive to acquire, and its cost curve is more elastic, reflecting an educational process whose marginal product diminishes later and more slowly. As in Figure 1, equilibrium wages are given by the shaded areas, each of which is divided into the current-period cost of acquiring skill h^* and the “surplus” available for current

consumption. (Note, however, that these graphs do not reveal the relative income of the two groups of workers since h_M and h_T are measured in different efficiency units.)

Although workers consider wages when choosing an occupation, it is not the gross wage w^* but rather the net wage ($w^* - rC^*$) that provides the relevant monetary incentive.⁸ In a competitive labor market where workers can change jobs and can invest in the skill of their choice, a long-run equilibrium is not reached until the net wage is the same for every occupation.⁹ This result can be generalized to a production function with any number of human capital factors. Each skill type has its own education production function with associated cost curves, each induces investment on the intensive margin up to the point where the marginal cost of additional skill is equal to its marginal value product, and workers choose which type to acquire by seeking occupations with the highest net benefit.

An important implication of this condition is that the long-run equilibrium value of a worker *per se* (i.e., labor rent) is the same in every occupation regardless of the observed wage distribution. That is, if workers all have equal access to human capital formation in either sector, absolute differences in the gross wage ($w_M - w_T$) in long-run equilibrium would be entirely explained by differences in the cost of human capital investments and have no implications for differences in consumption power. In an economy where economic rent is high, all consumers

⁸ For example, a person choosing between careers as a doctor or an EMT (emergency medical technician) knows that doctors are paid much more than EMTs, but the total cost of medical school (direct cost plus opportunity cost) is much higher than the cost of EMT training. The difference in net wages is thus the relevant monetary incentive for choosing a career path.

⁹ Mobility between occupations for a given individual may involve retraining, but more often it occurs *ex ante* as new entrants to the labor force weigh their job options. Although retraining can be important in a fluid economy, adjustments at the margin as older workers leave and new workers enter may be sufficient to bring about equilibrium in the labor market.

would be well off and the population as a whole is prosperous. Similarly, if economic rent is low consumers would have little discretionary spending and the economy is “poor.”¹⁰

IV. Rethinking Economic Development Goals

Experience with Western economic development during the 20th century suggests some lessons that require revisions in our objectives for developing countries in the 21st. It should now be clear that industrialization alone is not sufficient to improve the well-being of the populace, just as it is clear that government control *per se* cannot solve all of a nation’s economic problems. If the 20th century saw new technologies that sometimes replaced and sometimes complemented the old, these are now in turn being replaced and/or complemented by even newer technologies. At the turn of the 20th century social classes could still view themselves as workers or capitalists, depending on whether their income was derived from labor or non-human capital, and living conditions varied by class. By the end of that century people of all classes participated in the labor market, everyone invested in human capital, and people of all classes invested in non-human capital via the financial markets whether directly or indirectly through pension plans. Socio-economic distinctions between capital and labor were blurred if not entirely obsolete, replaced by education as the most salient determinant of social class.

Rethinking the goals for economic development in LDCs requires updating our assumptions about the nature of human capital, about the distinction between workers and capitalists, and about the role of government in managing the economy. Thus far we have

¹⁰ This has implications for interpreting measures of income inequality. For example, a standard human capital earnings function decomposes the log variance of income into two parts, one that is “explained” by the cost of investments in human capital, and an unexplained “residual variance” which may be capturing net income inequality as well as individual differences in compensating differentials. If so, the residual variance would reflect the inequality in living standards that is commonly understood as income inequality.

focused on the first of these issues, rethinking production functions and factor markets. In this section we turn our attention to development policy, implicitly the role of a national government in facilitating the achievement of development goals.

A. Paying for Economic Development

By the end of the 20th century it was no longer plausible for an LDC to assume that investments in its stocks of human and non-human capital are costless to the domestic economy. Expanding production requires domestic investments, whether financed by reallocating domestic resources or by loans from abroad that must be repaid. Productivity must be measured by the value of production net of these costs, suggesting that the appropriate objective should be to raise net income (i.e., aggregate consumption) rather than gross income (aggregate production).

The production functions in equations (1) and (2) are specified with respect to a unit of time, with output conventionally measured on an annual basis and inputs as a flow of services provided within that same year. That is, rK is the rental value of K (or the interest payment required for a loan of K dollars) and the annual wage bill wL is the rental value of services provided by the stock of human capital H . Net income N during this period – also conventionally measured on an annual basis – requires subtracting the cost of these flows from aggregate production. That is,

$$N = Y - (rK + wL) = Y - [rK + v_M H_M + v_T H_T] \quad (10)$$

By refocusing on raising consumption rather than production, and by taking ownership of all forms of investment, LDC economic development in the 21st-century has an objective function that maximizes N – equation (10) – subject only to one constraint on the size of the total labor force L – equation (3). Everything else – whether the size of the capital stocks (human and non-human) or their allocation between the two sectors – are the outcome of investment decisions and therefore endogenous to this system.

B. Improving Standards of Living

The economy can be stimulated by improvements in productivity, by innovation, by industrialization, by additional exploitation of natural resources, or by opening new trade markets. Whether this activity is enriching or immiserating – that is, whether it is associated with conventional notions of economic development – depends on its implications for the economic rent earned by its workers (i.e., their earnings net of the cost of investments in human capital). The net wage level (labor rents) can thus be understood as a proxy measure for the economy's level of development, a more satisfactory indicator than per-capita income which is in turn a proxy for the average (gross) wage level.

If the goal of economic development is to raise standards of living, its economic objective involves maximizing net income subject to a country's resource constraints. For a closed economy with few natural resources, the size of the labor force is the only constraint that cannot be augmented through wise investment. The objective function for a dual economy can thus be modelled as maximizing consumption (N in equation (10)) subject to the size of that country's total labor force (L in equation (3)). Setting this up as a Lagrangian function with multiplier λ , and substituting equations (1), (5) and (6) to express this in terms of the basic independent variables yields the objective function:

$$\begin{aligned} \mathcal{L} = & [f(h_M L_M, K_M) + g(h_T L_T, K_T) - r(c_M h_M L_M + c_T h_T L_T + K_M + K_T)] \\ & - \lambda(L_M + L_T - L) \end{aligned} \quad (11)$$

The first-order conditions for maximizing this function (derived in Appendix) are:

$$r = f_H/C'(h_M) = g_H/C'(h_T) = f_K = g_K \quad (12)$$

$$r = \frac{f_H h_M - g_H h_T}{C(h_M) - C(h_T)} \quad (13)$$

$$\lambda = h_M [f_H - r c(h_M)] = h_T [g_H - r c(h_T)] \quad (14)$$

The conditions in equation (12) say that investments should be allocated between sectors and between factors within sectors (i.e., between h_M , h_T , K_M , and K_T) so as to equalize the marginal benefit per dollar spent. Equation (13) says that the same criterion should be used to allocate workers between sectors; that is, workers should choose which kind of human capital to acquire by looking at the between-sector wage difference relative to the cost difference. Equation (14) defines the Lagrangian multiplier λ as the net wage of a worker, depicted by the dark shaded areas in Figure 2, and says that this should be equalized between the two sectors. Since labor markets are in equilibrium when the marginal product of h equals the current-period value of its marginal cost, this condition may be rewritten:

$$\lambda = r h_M [C'(h_M) - c(h_M)] = r h_T [C'(h_T) - c(h_T)] \quad (14a)$$

so that $\lambda \geq 0$ whenever $C' \geq c$. That is, economic rent is positive as long as the wage (marginal cost) exceeds average cost, and workers are optimally allocated between sectors when everyone earns the same net wage (economic rent).

These maximization conditions suggest that the optimal strategy for raising living standards is consistent with a free-market model of all factor markets. They also suggest that inequality in consumption opportunities is minimized – if not eliminated – by well-functioning labor and capital markets. The implication for government economic policy is less clear and will be the subject of the next section.

C. Rethinking Government Policy

Although the model developed above suggests that free factor markets might achieve the optimal allocation of resources, this model is an abstraction that does not account for real-world exigencies. Yet experience with governmental management – whether through regulation or nationalization or something in between – suggests skepticism for that approach also. While devising an ideal government policy is well beyond the scope of this paper, the optimizing

conditions in equations (12) through (14) suggest some basic guidelines for revised development policies.

1. Access to Capital Markets

The obvious implication of equation (12) is that investments should be allocated to projects with the highest rate of return, without prejudice as to sector or whether the capital is embodied in workers. This does not mean that every loan needs to have the same rate of interest, for observed terms include adjustments for uncertainty, risk, etc. Yet the basic rate of return to the lender should not privilege the modern sector over the traditional, nor should it favor investments in non-human capital over student loans. This is simply sound business when the sole object is to maximize profitability to the lender.

2. Between-Sector Labor Mobility

Suppose that everyone is raised in a family living and working in either the modern or traditional sector, and that labor force entry involves deciding whether to remain with the familiar or to switch to the other sector. This is a deeply personal choice between stability and adventure, more than simply a difference in earnings, but also a change in lifestyle. Lifestyle differences arise in part because the technology of each sector involves a difference in the relationships between labor and non-human capital, between work and leisure, and often between living conditions and consumption patterns. These differences in turn affect household formation, marriage and fertility decisions, and – often – political preferences. Choosing which sector to work in is more than just choosing an occupation.

Equation (14) says that workers are optimally allocated between sectors when labor rents are the same in both sectors. This need not mean that everyone has the same disposable income. Workers are people with personal preferences for both working conditions and consumption

patterns, as well as preferences over allocating time between work and leisure. A preference for one sector is a non-pecuniary benefit that might cause him or her to accept a lower wage, while a distaste would require a higher wage before choosing that sector. The labor rent λ in equation (14) is thus a proxy for the marginal utility – i.e. money plus non-pecuniary benefits and costs rather than money alone – of working in a given sector of the economy.

This condition gives agency to the individual to know in which sector he or she wants to work. The role of government policy is not to make that choice for the worker, but rather to remove barriers to free mobility. These barriers can be social or political as well as economic, and government policy has a role to play in removing social stigma associated with one sector over the other, as well as avoiding political or financial favoritism towards either sector.

3. *Access to Education*

A significant economic barrier to between-sector labor mobility is the type of skill embodied in each worker. At some point in a young person's education, whether formal or informal, a decision is made to specialize in either h_T or h_M , thus effectively deciding in which sector he or she expects to work. This is usually thought of as curriculum policy *per se*, although it clearly has implications for economic development as well. It is in this respect that it is appropriate to consider curriculum issues associated with economic development.

Elementary education provides literacy and numeracy to all children as well as some basic concepts of applied science and social studies. In the age of smart phones and internet, workers in traditional as well as modern sectors should become fully aware of and familiar with using both means of communication. Before any specialization occurs, all students should acquire enough knowledge of modern-sector analytical tools to establish their abilities and evaluate their own preferences. Only at this point – probably sometime in their early-to-mid

teens – should they be formally tracked into a sector-specific curriculum. Conditional on this choice, the rate of return criterion in equation (12) should decide how long to stay in school.

V. Looking Back, Moving Forward

The 20th century saw dramatic changes in the economic life of almost all countries, both more developed and less developed. It also saw dramatic changes in the economics of growth and development, whether policy or theory. Mid-century – the decade from 1945 to 1955 – was a time of stock-taking, resolving to atone for bad economic policies of previous decades and devising optimistic economic policies to guide the future. It was a decade of post-WWII recovery in the economies of more-developed countries and a decade in which third-world colonies were becoming independent LDC countries. This was the context in which W. Arthur Lewis published his seminal article on the dual economies in LDCs, in which he adapted classical growth theory for insights into how modernization could become a vehicle for economic development (Lewis 1953).

By the start of the 21st century the world economy had changed again, perhaps even more dramatically, along with the economic tools which guide both theory and policy. Technology is a large part of this change, greatly enhancing global networks of information, communication, transportation, and production. Unlike mid-20th-century economists, we now have data – both statistical and qualitative – as well as country-specific experience that effectively explodes myopic myths that traditional sectors lack entrepreneurial acumen and development potential. The optimal role of government in the economy is still debated, but it is now informed by recent historical experience from countries with extreme versions of socialist, fascist, regulatory, and laissez-faire economic policies.

Economic theory also experienced changes in the second half of the 20th century, none more dramatic than the change in labor economics with the introduction and development of human capital theory. This change also came about most forcibly in the 1960s, although there had been earlier precedents laying the groundwork. Prior to this, workers were viewed as nothing but warm bodies (sometimes described as “raw” labor), interchangeable parts in the production process, without regard to any personal traits other than perhaps age, sex, and hours of work. Growth models counted only their numbers and gave them no agency unless they were aggregated into unions with bargaining power. In contrast, human capital theory recognized individual differences in abilities and preferences, giving workers agency in choosing what type and how much skill to acquire as well as occupational and geographic choice as to where it is applied.

The model developed in this paper is an effort to take these changes into account when we assess the problems of economic development in LDCs. Part II reformulates the economic role of the traditional sector in the development process. Acknowledging that traditional production processes require both human and non-human capital, it specifies sectoral differences as essentially differences in production technology without privileging either sector as a potential source of economic growth. This section also breaks with conventional production models by specifying human capital as an inalienable attribute of the workers in whom it is embodied. Part III considers the supply of human capital in more detail, looking at incentives for investing in skills within sectors (i.e., skill intensity) as well as incentives for reallocating workers to their optimal distribution between sectors (i.e., occupational and/or geographic mobility). Part IV looks at some implications of this model for 21st-century economic development policy. It takes optimizing consumption (i.e., raising standards of living) rather than industrialization or raising

GDP as the primary policy goal, and assumes the effective absence of serious concessionary lending from capitalists with deep pockets, whether public or private.

Of all the changes that this model introduces, and of all the policy implications derived from it, perhaps the most significant are related to the agency of workers in the economy. Regardless of any earnings gained by moving between traditional and modern sector workplaces, it is up to the workers themselves (and their families) to decide whether the move is worthwhile. This decision affects what kind of education they should choose, and thus the cost of acquiring the relevant skills. Regardless of who pays the financial costs for that education, workers themselves must participate and thus have agency in the process of skill-formation.

Other important implications of the model developed here involve recognition that the traditional sector and its people are “rational” economic actors and can be active participants in the development process. By emphasizing consumption as a public policy goal, and by specifying the relationship between human capital and the workers in whom it is embodied, the model also generates implications of development policies for income inequality and the reduction (or not) of poverty.

VI. References

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VII. Figures

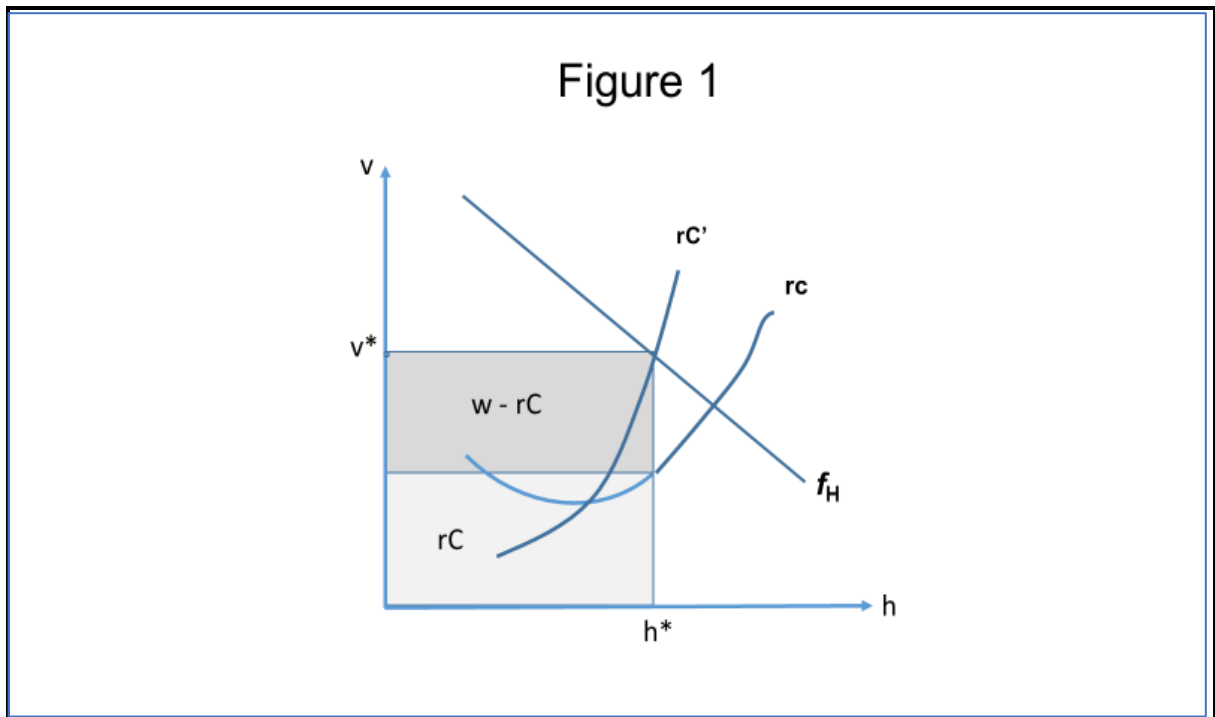


Figure 2

