A GENERAL EQUILIBRIUM SKILL ACQUISITIONS MODEL OF DEVELOPMENT FOR LESOTHO

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Dual economy, large unemployment, a fixed number of skilled workers, perfect capital mobility, migrant labor force working in South African gold mines, and a cycle of poverty characterize Lesotho. This paper develops a general equilibrium model for Lesotho specifying these absorbing economic characteristics. We are particularly interested in constructing a rising step skill acquisition function, which shows that small infusions of human-capital investment would not pull the economy out of its poverty trap, but a large infusion would.

Keywords: Lesotho, Skill Acquisition, Human Capital, Economic Development, General
          Equilibrium
JEL classification: D5, F2, O1, O2

1. INTRODUCTION

Economic development is a process, which transforms a society in such a way that it raises the Standard of Living, very broadly conceived, for a large proportion of its members.[1] Lesotho provides an example of a society with a high unemployment rate and a low standard of living: in 2002, its annual per capita income was US$ 502, and it ranked 124th out of 179 on the Human Development Index. Lesotho is a country characterized by a small population (2.04 million in 2001), large scale unemployment, and potentially no barriers to inflow of foreign capital.[2] The government of Lesotho did not implement free primary education until the year 2000 indicating the low level of human capital development in the country.[3] Many, including Hassan (2002), characterize Lesotho's low quality of education as one of the obstacles to sustainable development.

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[1] See Amartya Sen (1987) on the *Standard of Living*.

[2] In addition to large-scale unemployment, Lesotho also exhibits underemployment and disguised unemployment.

[3] See World Bank (2001, p 23)

In addition to the contribution by Plath, Holland, and Carvalho (1987), in a recent World Bank Study, a 50 sector SAM (Social Accounting Matrix) was constructed as the basis of a computable general equilibrium (CGE) model.[4] Despite IMF's year-round contribution of a staff member to the Central Statistical Office in Maseru, Lesotho, the available data is both sparse and highly unreliable. A CGE model calibrated to a SAM based on such unreliable data, and policy change simulations based thereupon, do not provide much guidance for a comprehensive understanding of the economic forces that produce the social outcomes (of general equilibrium) which, as equilibria, are characterized by inertia.

In spite of these shortcomings, it is important to note that the World Bank Study does provide insights into some of the key features characterizing the general equilibrium (inertial) social outcome. The three most significant features in this regard are the employment of and remittances from Lesotho workers in South African gold mines, the severe shortage of skilled domestic workers and the revenues from Lesotho Highlands Water Project. We take advantage of these insights, and construct a *theoretical*, as distinct from computable, general equilibrium model of Lesotho so as to identify the sources of inertia in the economy and how they may be overcome.

The shadow wage rate in Lesotho is near zero, so that from an economic standpoint, it has an unlimited supply of labor. If the unskilled labor force in Lesotho were to decline slightly, the GNP of the country would fall only marginally, if at all, indicating a near zero shadow wage rate.[5] This is typically the state of affairs in any economy with "surplus" unskilled labor. Some Lesotho males work in the South African gold mines. From amongst the remaining, some are employed in the public sector; and some are employed in the modern, formal, skilled labor sector. The rest of the labor force is unemployed, engages in subsistence cattle farming, or is employed in the urban informal sector.[6] The labor markets, for skilled and unskilled workers, the availability of credit and infrastructure, and employment in the informal sector, collectively present intriguing phenomena in Lesotho which, to date, are not adequately understood. Hence arises the importance of the model for Lesotho that captures the Lesotho migrants in South Africa, the structure of forces that tend to keep Lesotho from experiencing economic

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[4] Plath, Holland, and Carvalho (1987) found that improved agricultural practices, such as simple rotations of traditional field crops, held the potential to generate domestic income in excess of that offered to migrants in the South African Gold mines.

[5] On a very closely related issue, but for economies with large populations, see Lewis (1954) who explained why wages remained low and profits rose in both the early stages of the industrial revolution in Britain, and in the less developed countries in the first half or the twentieth century, by introducing the celebrated hypothesis of "unlimited supply of labor." Indeed, he demonstrated that "the result is a dual (national or world) economy, where one part is a reservoir of cheap labor for the other. Unlimited supply of labor derives ultimately from population pressure, so it is a phase in the demographic cycle."

[6] Not surprisingly, cattle are a store of value in Lesotho.

development, and particularly identifies skill acquisition policies that will be effective and the ones that are doomed to failure. And why does this economy fail to experience growth in employment and productivity via increases in capital utilization, through domestic accumulation or foreign inflows? This is a fundamental question that must also be answered. For, without a clear understanding of the causes of underdevelopment, no serious policy recommendation can be made.

The purpose of this paper is to explain the structure of forces that tend to keep Lesotho from experiencing economic development. We accomplish this by constructing what is essentially a dual-economy general equilibrium model along the lines of Lewis (1954), and Harris and Todaro (1970). However, in order to adequately model Lesotho's large unskilled labor force's inability to attain sufficient skills, such as reading, writing and basic machinery skills, to enter the formal labor market, we introduce a skill-acquisition function based on efficiency wage and hysterisis arguments. The insight into Lesotho's labor market rigidities brought about from inclusion of the skill-acquisition function is the primary contribution of this paper.

1.1. Some Stylized Facts and Assumptions for the Model of Lesotho

In 1998, approximately thirty per cent of the GNP of Lesotho came from the remittances from Lesotho men working in South African gold mines, and about six percent from the formal sector comprising of the blue jeans industry. Lesotho's share of import tariff revenues collected by the South African Customs Union (SACU), and the royalties from South Africa for the water they receive from the Lesotho Highlands Water Project, make up the rest, with virtually no agricultural income going through the market, and the informal sector contributing an undetermined amount.

The state of affairs in Lesotho are those in any economy with "surplus" unskilled labor. Yet, when the government hires additional unskilled workers in the public sector, it pays a relatively high wage rate (certainly in excess of the zero shadow price of unskilled labor). This wage payment, and the public sector annual wage increases in the 7-10% range achieved by Lesotho labor unions, essentially constitute transfer payments from the productive members of the society (including migrant workers in South Africa) to the less productive, unskilled workers. Naturally, such payments are a fiscal drain on the economy, and, unless there are productivity gains through education and training, or a large inflow of foreign capital, Lesotho is bound to experience a fiscal crisis that will deepen in the years to come.

As noted, the key stylized facts that must be captured in the model for Lesotho are the Lesotho migrants in South Africa who send remittances back to Lesotho, the unskilled workers in the government sector, formal and informal sector employment, investment in human capital, and infrastructure investment that reduces transport costs. Very little income generation actually occurs in Lesotho. Further, the bulk of the commodities consumed in Lesotho are imported from South Africa.

To incorporate these stylized facts we explicitly make the following assumptions.

First, capital is internationally mobile into or out of the economy.[7] Further, the efficiency-wage hypothesis holds for the low-wage, unskilled workers in the informal sector since at very low wage rates, such as those that exist for the unskilled workers in the informal sector, mere needs of minimal nutrition, and, sometimes transportation costs, provide grounds for modeling the unskilled, informal structure in this manner.

This general equilibrium model includes several additional features that are very specific to Lesotho. However, as we elaborate on this matter in later sections, the core model is general enough, so that, shorn of these particular details, it is applicable to many countries with small populations including Botswana and Namibia.[8]

The core stylized facts and the essential argument we construct are the following. The economy has a high-wage modern or formal sector that produces a small fraction of the country's GNP. From this stylized fact we explicitly assume the modern sector employs *skilled* labor. There is also a low-wage informal sector, which acts as a reservoir of effectively unlimited supply of unskilled workers. But these workers are not directly *employable* in the formal sector unless they are first transformed into skilled workers. Skill acquisition can occur at the expense of scarce resources. The technology of transforming unskilled into skilled labor is such that *large doses of resources must be spent; small infusions do not work.*[9] From this stylized fact we conclude there are discontinuities (lumpiness) in the skill acquisition process. At least this is the perception or conjecture of all existing and potential entrepreneurs and workers. The economy thus remains caught in a low-level equilibrium trap or a Nurkse (1953) equilibrium, not because there is any shortage of capital, but because there are limited supplies of skilled workers. Further, left to the labor markets, these supplies will not rise to their Pareto efficient levels. This is because the social rate of return on investment in education and training is greater than the private return, *and* because both entrepreneurs and workers fail to recognize the economy-wide benefits of small doses of investment in training that they can individually or jointly finance. Stated differently, in the production of skilled workers, there is a positive externality: it is the conjecture of all workers and firms that their gain from spending on education, training and skill-acquisition is less than the actual social gain.[10] We incorporate this stylized fact into the model in the form of the

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[7] On international capital mobility in large-scale general equilibrium models see the work of Neary (1988, 1985), Neary and Ruane (1988), and Chandra and Naqvi (1997), among others. On human capital investment in general equilibrium, see Findlay and Kierzkowoski (1983).

[8] The population of Botswana is about 1.6 million, and that of Namibia just over a million. Contrast this with the population of Bangladesh or Kenya.

[9] This is a very important assumption of our model. We describe below why we make this assumption and the role it plays in the model.

[10] This externality is precisely in the sense of Chipman (1970), who proved that free entry and exit and perfect competition are consistent in general equilibrium with external, or what he calls parametric, increasing returns to scale in some, though not all, sectors of the economy, with the *proviso* that these returns

assumption that the social rate of return on investment in education, training and skill acquisition is greater than the private return. In the formal sector, no single, competitive entrepreneur finances investment in training either alone or jointly with his employees. This is because he fails to recognize its economy-wide benefits. If, however, a critical mass of entrepreneurs or workers, or both, were to spend a large enough amount on training, the economy would leap out of this vicious circle of poverty.[11] In addition, and in line with the stylized facts above, we also assume that some Lesotho males are employed in South African gold mines, and they remit a portion of their income back to Lesotho.[12]

In the Section 2, we develop the core model based on the stylized facts described above, present the general equilibrium solutions to our model and introduce a skill-acquisition function into the model to capture the stylized fact of lumpiness observed in the technology of transforming unskilled into skilled labor.[13] This lumpiness is expressed in the form of a discontinuous step function. In Section 3 we posit some alternative development strategies for Lesotho. Section 4 summarizes out results and provides suggestions for future research.

2.   THE BASIC MODEL

2.1.   Model with a Fixed Supply of Skilled Workers

Assume that an economy produces two goods, an informal sector output of Commodity 1 or food in the amount x_1, and a formal sector output of Commodity 2 or cloth in the amount x_2. In the informal sector, capital in the quantity K_1, and unskilled labor in the amount L_1, are employed through a concave and linearly homogeneous technology. Domestically, unskilled workers earn a wage rate w_1. The formal sector also employs K_2 quantity of capital, but with skilled labor in the amount S_2, again with concave and constant returns to scale (CRS) technology. In Sector 2, these workers earn an endogenously determined skilled wage w_S. There is $\overline{K}$ amount of domestically (Lesotho) owned capital, whereas the capital in use in Lesotho is K, so

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are mild and not very rapidly increasing. For, if the external increasing returns are very rapid, the production surface exhibits non-convexity, and the economy admits multiple competitive equilibria.

[11] Basu (1984, 1997) provides a particularly articulate discussion of the low-level equilibrium trap, Nurkse equilibrium and other poverty-trap equilibria. Also important here is the recent book by Ray (1998).

[12] In our analysis, we do, from time to time, consider the implications of relaxing some of these assumptions.

[13] The model in Section 2 is very general. From this setup, various special models can be developed to capture the unique characteristics of other countries.

that $K^* = \left(K - \overline{K}\right)$ is the quantity of foreign owned (mostly South African and Chinese) capital employed in Lesotho. Lesotho is a small open economy both in world commodity and capital markets. Thus it takes the world commodity prices p_1^*, p_2^*, and the world return to capital r^*, as parametrically determined on international commodity and capital markets.

The production functions in the two sectors are,

$$x_1 = F(K_1, e(w_1)L_1),$$ (1)

and

$$x_2 = H(K_2, S_2).$$ (2)

with the restrictions that both $F()$ and $H()$ are concave and homogeneous of degree one in both arguments, and that all marginal products are strictly positive but diminishing. This implies that all cross partials of the production functions are positive, or that capital and unskilled labor in Sector 1, and capital and skilled labor in Sector 2, are both cooperative factors. This essentially means that an increase in the employment of a factor in any sector raises the marginal product of the other factor employed in the same sector.[14]

The term pre-multiplying the employment of unskilled labor in the informal sector in (1) is the efficiency wage function $e = e(w_1), e'(w_1) > 0, e''(w_1) < 0$.[15] The efficiency-wage hypothesis has a long history. However, the approach we adopt here is that in Solow (1979), where he demonstrates that, at the optimum, the elasticity of the efficiency units delivered by a worker with respect to the wage rate must equal unity. That is,

$$\frac{de}{dw}\frac{e}{w} = 1.$$ (3)

Equation (3) is commonly known as the Solow elasticity condition. It says that it is in the interest of the employer to pay that wage at which the additional gain in efficiency is exactly offset by the extra wage-payment cost. At very low wage rates, mere needs of minimal nutrition, and, sometimes, workers' transport-costs, provide adequate justification for adopting this hypothesis.[16] Throughout we assume that the efficiency wage hypothesis holds for the informal sector workers.

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[14] In addition, we assume that all inputs are indispensable.

[15] For empirical works related to efficiency wage see MacLeod *et al.* (1994).

[16] For more on this, see Dasgupta and Ray (1986), and Ray (1998).

Let p_1 and p_2 be the domestic prices of the two commodities in Lesotho, assumed fixed for now. We assume, for now, that $p_i = p_i * + \tau_i, i = 1, 2$, where τ_i is the *fixed* cost of transporting goods between Lesotho and South Africa incurred in sector i.[17] The other relationships are the usual first order conditions of profit maximization,

$$p_1 F_K(K_1, L_1) = r *, \tag{4}$$

and

$$p_1 H_K(K_2, S_2) = r *, \tag{5}$$

where (4) and (5) say that the values of marginal product of capital equal the given world rental rate of capital. If the domestic return to capital in Lesotho, r, is greater than the world return, $r*$, capital flows into Lesotho. On the other hand, if $r < r*$, capital flows out of Lesotho, so that in capital market equilibrium, $r = r*$, and K is fully employed. Therefore we have,

$$K_1 + K_2 = K, \tag{6}$$

with the requirement that $dr = dr* = 0$.

Similarly in the labor markets,

$$p_1 F_L(K_1, L_1) = w_1, \tag{7}$$

$$p_2 H_S(K_2, S_2) = w_S, \tag{8}$$

and

$$p_G * G_L(L_3 + L_{SA}; \Omega) = w_G, \tag{9}$$

where $x_G = G(L_3 + L_{SA}; \Omega)$ is the gold production function in South Africa, G_L is the marginal product of labor in South African gold mines, L_3 is the number of Lesotho workers employed there, L_{SA} is the number of South African and other (non-Lesotho) workers employed there, and w_G is the South African wage rate paid to workers in the gold mines. We assume that w_G is fixed by miners' unions in South Africa. Also, in (9), $p_G *$ is the fixed world price of gold, and Ω is the set of other inputs affecting the

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[17] We later consider the implications of relaxing this assumption of fixed transport costs.

output of gold.[18]

All that remains now is to add the Lesotho budget constraint,

$$p_1 c_1 + p_2 c_2 + \Gamma + \varepsilon = p_1 x_1 + p_2 x_2 - r^* K^* + T + \alpha w_{SA} L_3 , \tag{10}$$

and the requirement that every person's marginal rate of indifferent substitution equals the price ratio so that,

$$\frac{dc_2}{dc_1} = -\frac{p_1}{p_2}. \tag{11}$$

holds on the demand side. In (10) and (11), c_i is the consumption of *good i*, α is the fraction of Lesotho income earned from South African gold mines that is remitted to Lesotho, Γ is government expenditure that does *not* result in labor movement from the unskilled to the skilled labor force, and T refers to all lump sum tax revenue of the government including duties collected by the South African Customs Union and the revenue from the Lesotho Highlands Water Project. For now assume that ε is some arbitrary constant, and the number of skilled Lesotho workers at any given time is parametrically fixed at $\overline{S}_2$. We will, of course, relax this assumption later. Assume also that government spending and taxes are exogenously given.

2.2.   Solving the Model

To solve the model, first note that, given the Solow elasticity condition (3), from (4), (5), and (7) *alone* we obtain the general equilibrium values of K_1, K_2, w_1 and L_1 as functions of the parameters, p_1, p_2, r^* and $\overline{S}_2$. By substituting these three variables in (1) and (2) we can *independently* solve for the output levels x_1 and x_2 in general equilibrium. Also, by substituting the same values in (8), we get the skilled wage rate as a functions of p_1, p_2, r^* and $\overline{S}_2$. With the knowledge of K_1 and K_2, from (6) we obtain the value of $K,$ and therefore of K^* as functions of these parameters and $\overline{K}$. Notice also that in (9), with given parametric values of $p_G^*, L_{SA}, \Omega,$ and w_G, the only variable is L_3, which can be solved for *separately* from this equation by itself as a function of only these latter parameters. And from (10) and (11), we obtain the values of $c_i, i = 1, 2,$ as functions of all parameters including $\alpha, \Gamma,$ and T. If one wishes to obtain the total number of unemployed Lesotho workers, it is simply $\overline{L} - (L_1 + L_2 + L_3)$, where $\overline{L}$ is the total Lesotho labor force, and L_2 equals a positive fraction of S_2

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[18] Of course, $G(.)$ is homogenous of degree one in *all* factors, not just labor.

and is the number of unskilled workers who have acquired skills.[19]

The parameters of the model are $p_1, p_2, r^*, p_G^*, L_{SA}, \Omega, w_G, \overline{K}, \overline{S}_2, \alpha, \Gamma$, and T. The endogenous variables determined in general equilibrium by the relationships of the model are $K_1, K_2, L_1, x_1, x_2, w_1$, and w_S. In the general equilibrium solution, these are dependent on p_1, p_2, r^* and $\overline{S}_2$ only. Next, L_3 is dependent on p_G^*, L_{SA}, Ω, and w_G only. And K^*, in general equilibrium, is a function of $p_1, p_2, r^*, \overline{S}_2$, and $\overline{K}$. Finally, c_1 and c_2 are functions of all parameters. To summarize, in our model there are eleven relationships in eleven endogenous variables, $K_1, K_2, L_1, x_1, x_2, w_1, w_S, K^*$, L_3, c_1 and c_2. Of course, as noted above, L_2 equals a positive fraction of S_2.[20]

2.3. Skill Acquisition Step Function

So far we have assumed a fixed number of skilled Lesotho workers, $S_2 = \overline{S}_2$. As noted above, stylized labor rigidities present a significant difficulty for Lesotho's economic development and, therefore, we now assume instead that Lesotho's labor market is characterized by the skill acquisition function, which is $S_2 = S_2(\varepsilon, \pi) =$

0, if $\quad 0 < \varepsilon < \varepsilon^0$, $\quad\quad\quad$ Regime 1

$\overline{S}_2$, if $\quad \varepsilon^0 \leq \varepsilon < \varepsilon^2$, $\quad\quad\quad$ Regime 2 $\quad\quad\quad\quad\quad\quad\quad\quad$ (12)

$\overline{\overline{S}}_2$, if $\quad \varepsilon^2 \leq \varepsilon < \varepsilon^3$, $\quad\quad\quad$ Regime 3, and

$\psi(\varepsilon + \pi)$, if $\quad \varepsilon \geq \varepsilon^3$. $\quad\quad\quad$ Regime 4

In (12), $0 < \varepsilon^0 < \varepsilon^2 < \varepsilon^3$, are exogenously specified values, ε is *public* expenditure on education, training and skill-acquisition, and π is private expenditure on the same activity, with $\psi'(\varepsilon + \pi) > 0$. The skill acquisition function posited above in (12) is presented in Figure 1, and warrants further comment.

The first property to note about the particular form of the skill-acquisition function we have adopted in the model for Lesotho is that, in the range of government expenditure on education, training and skill-acquisition, $0 < \varepsilon < \varepsilon^3$, it is a rising step

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[19] We later introduce an exogenously specified skill acquisition technology to endogenize S_2, and therefore, L_2.

[20] We follow the convention that the initial general equilibrium values of a generic endogenous variable z is described by a circumflex $(\hat{z})$.

function, but for larger values it is a smoothly rising function. We have deliberately adopted this form to take account of the externality mentioned above. It is precisely because workers and employers in the formal sector do not take into account the economy-wide productivity gains of investment in education, training and skill-acquisition that they fail to undertake this expenditure. Also, it has been found empirically, that the employability of workers in formal sector activities becomes possible only after attaining a tenth grade education in South Africa, Lesotho, Botswana, and Namibia.[21] If there is an increase in government expenditure that creates a widespread increase in education levels of workers from, say, the fifth to the ninth grade, it does not transform unskilled workers in to sufficiently skilled to be employable in the formal sector. This assumption, that large doses of investment in education, training and skill-acquisition are required, and that small infusions do not do the trick, is captured in the step-function nature of the skill-acquisition function in (12). Finally, of course, if there is a sufficiently high government expenditure on education, training and skill-acquisition, so that there is a large enough skilled labor force in the economy, in Regime 4, the externality becomes so weak as to not matter at all. From this point onwards, $\varepsilon \geq \varepsilon^3$, public and private expenditure on education, training and skill-acquisition become perfect substitutes, and the skills-acquisition function becomes a differentiable, smooth function, $S_2 = \psi(\varepsilon + \pi)$.

3.   ALTERNATIVE DEVELOPMENT STRATEGIES

We next provide some diagrams to facilitate the understanding of the key features of our model. This proves particularly helpful both for extending the model in several ways, including the addition of public-sector employment of unskilled labor, and for ascertaining the macroeconomic consequences of alternative development strategies.

Figure 1 displays the skill-acquisition function, *OS*, described in (12). Let $\overline{\varepsilon}$ be the exogenously determined public expenditure on education, training and skill-acquisition in the initial general equilibrium. To this corresponds a skilled labor force of $\overline{S}_2$, and $\hat{L}_2 = \#(\overline{S}_2)$. Of course, demand conditions matter. However, given the severe shortage of skilled/educated labor in Lesotho from and economic standpoint, this demand is virtually unlimited. Therefore, the production of too many skilled workers in Lesotho is not a problem that imposes a binding constraint. Further, the unskilled Lesotho workers employed in South African gold mines are $\hat{L}_3 = L_3(p_G{}^*, w_{SA}, L_{SA}, \Omega)$, which is determined by economic forces outside Lesotho. Then, as indicated in Figure 2, the Lesotho labor force is *O₁O₂*, or $\overline{L}$, so that $\overline{L} - \hat{L}_3$ is the number available for

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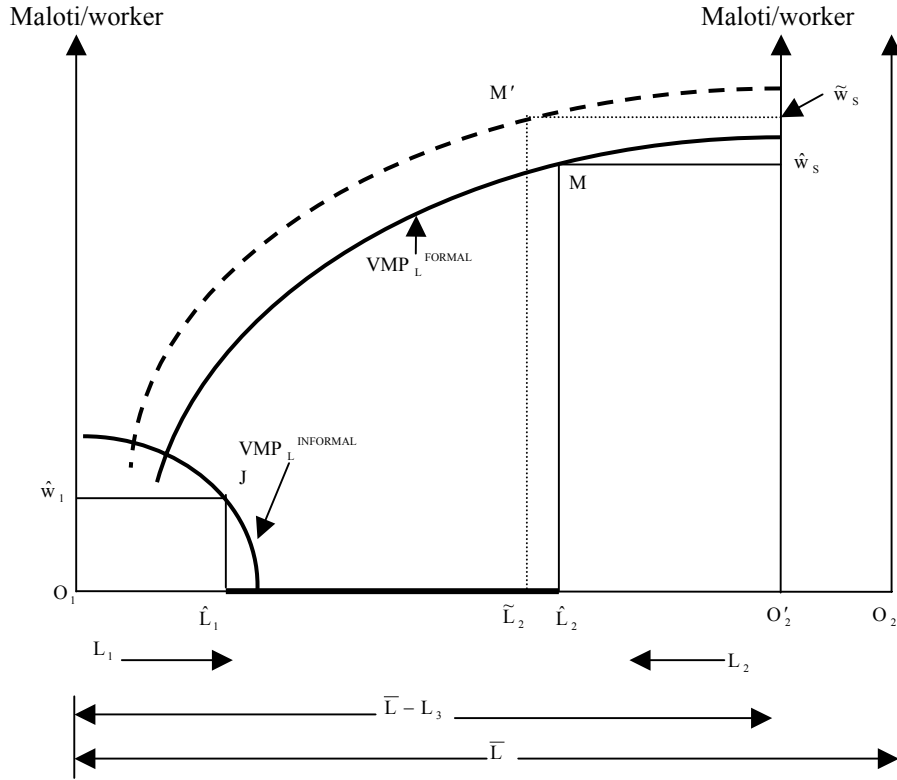[21] See Case and Deaton (1988).

employment in Lesotho. Of these, $O'_2\hat{L}_2$, determined by $\bar{S}_2$ (skilled workers) in Figure 1, are employed in the formal sector. The skilled wage rate, $\hat{w}_S$, can be read off point M. Informal sector employment is $O_1\hat{L}_1$, and the wage rate is $\hat{w}_1$, at which the Solow (1979) elasticity condition (3) is satisfied. Clearly, the line segment $\hat{L}_1 \hat{L}_2$ is the magnitude of unemployment in Lesotho.
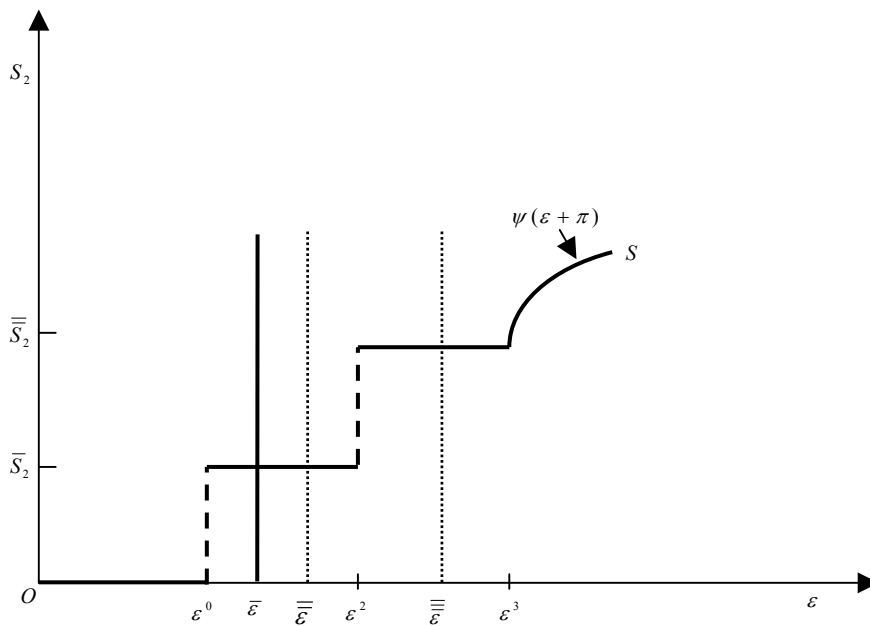
The step function *OS*, which is the graph of Equation (12), relates the supply or production of skilled workers as a function of public expenditure on education, training and skill acquisition. The vertical line at $\bar{\varepsilon}$ gives the level of current public expenditure on education in Lesotho. Corresponding to this expenditure level, the number of skilled Basotho workers is $\bar{S}_2$.

Figure 1.   Skill Acquisition Process

With everything else unchanged, suppose the government increases expenditure on education, training and skill-acquisition from $\bar{\varepsilon}$ to $\bar{\bar{\varepsilon}}$. As Figure 1 indicates, this does not increase the number of skilled workers in Lesotho, and the macroeconomic impact on both unemployment and GNP is nothing. This is because, as pointed out earlier, it is not productive to construct half a school or a quarter of a training institute.

The Basotho labor force is O_1O_2, or $\overline{L}$. The number of Basotho working in South Africa is L_3, so that $\overline{L} - L_3$ is the number available for employment in Lesotho. Of these, $O_2'\hat{L}_2$, determined by $\overline{S}_2$ (skilled workers) in Figure 1, are employed in the formal sector. The skilled wage rate, $\hat{w}_S$, can be read off point M. Informal sector employment is $O_1\hat{L}_1$, and the wage rate is $\hat{w}_1$, at which the Solow (1979) elasticity condition is satisfied. Clearly, the line segment $\hat{L}_1\ \hat{L}_2$ is the magnitude of unemployment in Lesotho.

Figure 2.   Labor Markets in Lesotho

On the other hand, if the government increases spending on education, training and skill-acquisition from $\overline{\varepsilon}$ to $\overline{\overline{\varepsilon}}$, there is an increase in the skilled Lesotho labor force from $\overline{S}_2$ to $\overline{\overline{S}}_2$. This increases total employment in Lesotho by $\hat{L}_2 - \tilde{L}_2 > 0$. Naturally, the unemployment rate falls, and the GNP of Lesotho rises. However, as a glance at Figure 1 indicates, this policy shift, while large enough to make some dent in the unemployment rate, does not pull the economy out of the low-level equilibrium trap. For, any additional, small increases in education, training and skill-acquisition

expenditure will again have no positive effect on employment or national income. Notice also that the size of the informal sector does not undergo any dramatic change when the formal sector grows due to a shift from $\bar{\varepsilon}$ to $\bar{\bar{\varepsilon}}$. It is quite clear, however, that if there is a sufficiently large increase in public expenditure to a magnitude $\varepsilon \geq \varepsilon^3$, then the informal sector contracts, the formal sector expands, and the economy of Lesotho reaches a full employment equilibrium. In this new equilibrium, Lesotho has broken out of the vicious circle of poverty. Further, in this new equilibrium, there is no need for the government to increase education, training and skill-acquisition spending - the private sector can take over, because public and private spending become perfect substitutes.

Similarly, we can analyze the macroeconomic impact of other policy changes, including, but not limited to, the employment- income- and poverty-effects of a switch in expenditure from public sector employment to education, training and skill-acquisition, or of a change in the world price of gold.

4.   SUMMARY AND CONCLUSIONS

We developed a general equilibrium model for Lesotho, and obtained the solutions to a rising step skill acquisition function. The results of the skill-acquisition function suggest that Lesotho can break out of its low-growth traps only with significant improvement in skills, both in terms of the number of skilled workers and the quality of the skills they acquire. The policy implication of these finding is that government and the private sector should invest on skill acquisition beyond the ninth grade level to transform the unskilled labor force into a skilled labor force. To achieve this goal, a significant amount of resources have to be allocated to human-capital investment.

The model constructed in this paper has a notable difference with Todaro's education model. Todaro's model suggests that developing countries need to make primary education their optimal goal, and that, educating the population beyond the eighth grade level will be socially sub-optimal. On the contrary, our model of a rising step skill-acquisition function suggests that the optimal strategy would be to provide education that extends beyond the ninth grade level to a very large proportion of the labor force.

We allow foreign capital (a complementary resource to labor) to be endogenously determined through the exogenously specified skill acquisition function. Studies of unemployment in developing countries show a persistent unemployment and underemployment among the educated. However, as Upadhyay (l993) effectively expressed it, in these countries, the proportion of the educated labor force to the total labor force is extremely low by any standard. A country characterized by a large mass of uneducated and unskilled workers has a small chance of inducing foreign investment and capital inflow in general. Hence, the study in this paper views skill acquisition a necessary step towards economic progress.

Other findings of the model include the following. Skill acquisitions would allow the

formal sector to attract foreign capital, and to increase employment. Wages fall in the formal sector without changing in the informal sector. Production in both the formal and informal sectors rise, but it rises negligibly in the informal sector. In general, changes in the informal sector would be zero or negligible while the formal sector undergoes major transform.

The stickiness of wage rates of the skilled labor in developing countries is not rigorously addressed in this paper; further work can incorporate a wage structure that considers this issue.[22]

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