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The Low-Skill, Bad-Job Trap

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Abstract

The paper explains how a country can fall into a "low-skill, bad-job trap," in which workers acquire insufficient training and firms provide insufficient skilled vacancies. In particular, the paper argues that in countries where a large proportion of the workforce is unskilled, firms have little incentive to provide good jobs (requiring high skills and providing high wages), and if few good jobs are available, workers have little incentive to acquire skills. In this context, the paper examines the need and effectiveness of training policy, and provides a possible explanation for why western countries have responded so differently to the broad-based shift in labor demand from unskilled to skilled labor.

JEL Classification Numbers:
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Summary

This paper analyzes how a country can fall into a "low-skill, bad-job trap," characterized by a vicious cycle of low productivity, deficient training, and low-skilled jobs, preventing the economy from competing effectively in the markets for skill-intensive products.

"Bad jobs" are ones associated with low wages and little opportunity to accumulate human capital. They are the lot of the working poor. "Good jobs" command higher wages and higher skills. The paper argues that in countries with a small proportion of skilled workers, firms have little incentive to provide good jobs, since such positions would be difficult to fill; but if few good jobs are available, workers have little incentive to acquire skills, since such skills would be likely to remain underutilized and consequently insufficiently remunerated.

Thereby the paper provides a possible explanation for why individual western countries responded so differently over the 1980s to a broadly common shift in labor demand from unskilled to skilled labor--with earnings differentials across skill groups rising in some market economies, but remaining constant or even falling in others.

The paper examines the interaction between two mutually reinforcing externalities: a "vacancy supply externality" and a "training supply externality." The former arises when an increase in the number of skilled vacancies raises the probability that skilled workers will find good jobs and thereby raises the expected return from training. The latter arises when an increase in the number of skilled workers raises the probability that firms with good jobs will find skilled workers to fill them, and thereby raises the expected return from supplying vacancies.

Each of these externalities in isolation would lead the market mechanism to provide insufficient training. When both externalities are present simultaneously, the market failure is considerably amplified.

It is shown that when an economy is in the low-skill, bad-job trap, "small" subsidies are associated with significantly smaller employment multipliers than are "large" subsidies. Finally, the paper argues that while the vacancy-supply and training-supply externalities make a policy stimulus for training both socially desirable and economically effective in any labor market equilibrium, the need for and effectiveness of such a stimulus--particularly one of sufficient magnitude--is especially pronounced when the economy is in a low-skill, bad-job trap.

I. Introduction

The secular rise in the demand for skilled labor represents an important opportunity for people to become more productive, earn higher wages, and find jobs with longer-term career prospects. Over the past decade policy makers in several advanced market economies have expressed increasing concern that certain sectors and population groups are failing to grasp this opportunity. It is often argued, for example, that some sectors of the UK and US economies have been less successful than their German and Japanese counterparts in taking advantage of the swing from unskilled to skilled work. Some segments of employers and employees, it is alleged, are caught in a vicious cycle of low productivity, deficient training, and insufficient availability of skilled jobs, and this prevents them from competing effectively in the markets for skill-intensive products.

This paper provides a formal basis for this argument. It analyzes how a sector can fall into what I shall call a "low-skill, bad-job trap." "Bad jobs" are ones associated with low wages and little opportunity to accumulate human capital. They are the lot of the working poor. "Good jobs" command higher wages and higher skills. The paper argues that in sectors with a small proportion of skilled workers, firms have little incentive to provide good jobs, since such positions would be difficult to fill; but if few good jobs are available, workers have little incentive to acquire skills, since such skills would be likely to remain underutilized and consequently insufficiently remunerated.

A growing body of empirical observations are consonant with this view. For example, in his analysis of the export performance of the United Kingdom and Germany, Oulton (1994) argues that since Britain has a less skilled workforce than Germany, the United Kingdom has a greater incentive to produce nontraded services, that are comparatively protected from foreign competition, and this specialization creates a comparatively large demand for less skilled labor. Mason, van Ark, and Wagner (1994), in their study of biscuit manufacturing plants in Britain, Germany, France, and the Netherlands, show that British value-added per employee-hour is significantly below that of the other three countries and that these productivity differences correspond to differences in workforce skills rather than differences in the age and quality of capital equipment. They argue that employers' decisions about what type of products to produce depends on the degree to which skilled labor is available.

Politicians and journalists often suggest that the relatively low levels of education and training acquired by African American and Hispanics make the proliferation of low-grade, dead-end jobs profitable which, in turn, weakens these people's incentives to accumulate skills. The persistence of the "urban underclass" is sometimes attributed to this phenomenon. Broadly similar arguments have been used to help explain the difficulties of some developing countries--such as India, Pakistan, and many African states--in building up the human capital necessary to produce sophisticated manufactured products.

In addition to providing a possible explanation for such phenomena, the paper also suggests a reason why western countries, experiencing a broadly

common shift in labor demand from unskilled to skilled labor, should have responded so differently over the 1980s--with earnings differentials across skill groups rising in some market economies, but remaining constant or even falling in others. The analysis here suggests that countries' different responses may be due to differences in opportunities for skilled employment, which may have arisen for historical and policy reasons: in countries that offer little support for education and training and that contain a large proportion of unskilled workers, the market mechanism may reinforce the existing lack of skills by providing little incentive to acquire more; whereas in countries with well-functioning educational and training institutions and large bodies of skilled labor, the free market may do much more to induce people to become skilled.

The policy implications of this analysis are strikingly at variance with those underlying the standard human capital theory. In Gary Becker's analysis (e.g., Becker (1962, 1964)), there are no market failures in the provision and acquisition of skills. When the skills are "general" in Becker's sense, firms are perfect competitors for labor, and thus workers' wages are equal to their marginal products. Since the workers thereby appropriate the full benefit from training, they have an automatic incentive to bear the full cost of it as well. This also applies to workers' investment in general education. When the skills are "specific" to individual firms, it is appropriate to share the costs of training so as to make the employers and employees internalize the costs of separations. In both cases, good and bad jobs are allocated efficiently. Employers and employees are fully compensated for the good jobs that are filled, and the bad jobs go to workers whose present value of marginal training costs exceeds the present value of the associated rise in their marginal productivity.

The traditional human capital theory took this to be the end of the story, since it implicitly assumed that all training could be decomposed into general and specific components. The analysis here suggests that this conclusion is untenable when firms are imperfectly informed about the availability of skilled workers and the workers, in turn, are imperfectly informed about the availability of good jobs. Under these conditions, training that is potentially useful to all firms is nevertheless not "general", since the imperfect information prevents all firms from having access to all the available skilled workers. Nor is this training "specific", since the information is generally available to more than one firm.

The critical issue is that in this intermediate range between the two extremes of "general" and "specific" skills, firms and workers are no longer able to appropriate all the benefits from training, and thus free market

activity may provide insufficient training incentives. 1/ A firm that creates vacancies for good jobs thereby raises workers' returns to education and vocational training (by increasing the probability that educated workers find good jobs), but the firm clearly cannot make these workers pay for this privilege. 2/ A worker who acquires further education or vocational training raises firms' returns from creating good job vacancies, but the worker cannot make these firms pay for his education or training. 3/

It is this market failure that is responsible for the low-skill, bad-job trap. There are two externalities at work here. The first is a "vacancy supply externality," whereby an increase in the number of skilled vacancies raises the skilled workers' chances of finding good jobs and thereby raises the expected return from training and education. The second is a "training supply externality," whereby an increase in the number of skilled workers raises firms' chances of filling their good jobs and thereby raises the expected return from opening skilled vacancies.

The first externality implies that when there are few good jobs, workers are undercompensated for acquiring skills. The second externality means that when a sizeable proportion of the workforce is unskilled, firms are particularly under-compensated for the creation of good jobs. These two market failures, clearly, reinforce one another.

The paper is organized as follows. Section II outlines the empirical background that motivates the analysis and examines alternative explanations for the diverse responses to the growth in demand for skilled labor. Section III presents a model of the low-skill, bad-job trap. Section IV spells out the policy implications.

II. The Background

One of the most remarkable labor market developments in advanced market economies over the 1980s has been the rise in the demand for skilled work relative to unskilled work. This relentless shift is usually attributed to

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1/ Stevens (1994) analyzes this problem with respect to the poaching externality. This paper, by contrast, examines the externality from the creation of skilled vacancies on the returns from skill acquisition, and the externality from education and vocational training on the returns from skilled vacancies.

2/ The firm is compensated not for opening vacancies, but for filling them. On account of the firm's imperfect information about the availability of skilled workers, existing vacancies are not automatically filled.

3/ The worker is not compensated for his education, but for using his education to perform a skilled job. Due to his imperfect information about the availability of skilled jobs, an educated worker is not certain to find a skilled job. Even if he does, he cannot appropriate the entire gain from his education, due to his employer's market power in the wage formation process (described in Section III).

the skill bias of technological progress and of international trade, as well as to changes and in the product demanded mix toward sophisticated services. Specifically, (a) the "computer revolution" has raised the demand for highly educated labor; (b) the increasing volume of imports, relatively intensive in unskilled labor, from the Far East, eastern and central Europe, and elsewhere, together with the relocation of production-line jobs to these countries, has reduced the demand for unskilled labor in the West; and (c) the rise in the demand for professional, managerial, medical, and technical services has raised the demand for skilled labor.

These developments were general, affecting all the advanced market economies in much the same way. Nevertheless, these has been a wide diversity of responses over the 1980s. Earnings differentials--by education, occupation, and skill--all widened dramatically in the United States and the United Kingdom over this period. By comparison, there was only a very modest rise in earnings differentials in Austria, Australia, Belgium, Canada, France, Japan, Netherlands, Portugal, Spain, and Sweden. In Denmark, Finland, Italy, and Norway, earnings dispersion (in terms of the ratios of the upper and lower deciles to the median) remained roughly unchanged over the 1980s; while in Germany there was a small reduction in dispersion over that period. 1/

The usual way of explaining these diverse responses to the broad-based labor demand shift is through inter-country differences in (i) labor supply movements and (ii) labor market institutions. Let us consider each in turn.

There is ample evidence in the United States and many European countries of a large influx of young people (in the 15 to 24 age range), and since youth earnings tend to be low, this depressed wages at the lower end of the wage distribution. 2/ There is also evidence in some countries of a fall in the growth of the supply of college-educated people, relative to

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1/ See Freeman and Katz (1993) and the *OECD Employment Outlook* (1993, pp. 158-65) for inter-country comparisons. Widening earning differentials in the United States have been documented by Bound and Johnson (1992), Katz and Murphy (1992), Levy and Murname (1992), and Murphy and Welch (1992).

2/ See Davis (1992) and the *OECD Employment Outlook* (1993, pp. 169-70) for inter-country comparisons, Ermish (1988) for the United Kingdom, and Katz and Revenga (1989) for the United States versus Japan.

the demand, which may have raised wages at the upper end of the distribution. 1/

As an explanation of why countries responded differently to a common rise in the demand for skilled labor, however, the labor supply story is not wholly satisfactory: the accelerated entry of young participants into the labor force, and the slow-down in the entry of well-educated people are developments that many western countries had in common over the 1980s, and thus they cannot provide a full account of why those countries had such diverse wage-employment experiences. 2/

The other account rests on institutional differences: differences in minimum wage laws, wage bargaining structures, and social insurance institutions may help explain why the increased demand for skilled labor generated greater earnings disparities in the United States and the United Kingdom than in the advanced market economies of continental Europe. Though plausible, this view has not as yet been formulated with the precision necessary to provide a firm theoretical and empirical foundation. Empirically, the difficulty with this account is that it does not tell us why the large earnings differentials in the United States and the United Kingdom have lasted for so long in the 1980s. For those who (like myself) do not believe that the existing unskilled workforces in these countries are essentially untrainable (or trainable only at prohibitive cost), it is puzzling why more unskilled workers did not become skilled, which would have reduced the skill-unskilled earnings differential.

Another problem with the labor-supply and institutional explanations above is that they are not really explanations at all. To say that a country fails to take full advantage of the rising demand for skilled labor because the supply of skilled labor has not grown sufficiently, is not terribly informative; it does not tell us why the skilled labor supply has been so unresponsive. To say that institutional rigidities--such as minimum wages and wage-compression agreements--rob people of the incentive to become

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1/ See Davis (1992) and the *OECD Employment Outlook* (1993, pp. 170-73) for inter-country comparisons, Katz and Murphy (1992) and Murphy and Welch (1992) for the United States, Katz and Revenga (1989) for the United States and Japan, and Erikson and Ichino (1993) for Italy. However, there is no evidence that the "college premium" widened in Germany, France, and the Netherlands over the 1980s. Moreover, the literature on the college premium does not distinguish between the demand for vocational skills and the demand for more general skills, such as those achieved in college. This may be important, since it is not clear that an increased supply of college-educated people is wholly appropriate for satisfying the increased demand for skills.

2/ Although the earnings of the young fell relative to prime-age earnings in Canada, France, Japan, the United Kingdom, and the United States, these trends clearly offer no consistent explanation of why these countries have experienced such diverse changes in earnings differentials.

educated and trained, does not explain how these rigidities came into being and what incentives people have to keep them in operation.

This paper, as noted, takes a different approach. It explains how a sector of an economy could fall into a low-skill, bad-job trap, while another--facing similar labor demand and labor supply conditions--may have a high proportion of skilled workers and good jobs. 1/ The analysis also suggests an answer to the question why the large earnings differential between skilled and unskilled labor has lasted so long in the United States and the United Kingdom: the degree to which a given earnings differential induces workers to acquire skills depends on the availability of good jobs. When people are caught in the low-skill, bad-job trap, relatively few good jobs exist, and thus even a large earnings differential may provide little incentive for the unskilled to become skilled. In that event, the earnings differential may persist.

In this respect the analysis also points to underpinning for the institutional and labor-supply accounts of earnings disparities. It suggests that in countries with a large proportion of unskilled labor and insufficient provision of education and training, voters will have relatively little incentive to dismantle institutional rigidities, since that would hurt a relatively large group of unskilled workers and help a relatively small group of skilled ones. Similarly, the skilled labor supply may not be very responsive to earnings differentials in such countries, since there are relatively few job skilled opportunities for skilled workers--and the dearth of job opportunities, of course, is due to the dearth of skilled labor.

The following sections analyze the low-skill, bad-job trap in terms of a particularly simple model.

III. The Interaction Between Training and Good Jobs

Consider a sector with the following straightforward structure. There is a fixed number of workers, who are either "unskilled" or "skilled." The unskilled workers are only able to work at "bad jobs," at which their marginal product is α_u (a positive constant). The skilled workers are also able to work at "good jobs," where their marginal product is α_s (also a positive constant), with $\alpha_s > \alpha_u$.

All workers live for two periods. At the beginning of the first, each worker decides whether to acquire the education (or training) necessary to become skilled. The unskilled workers acquire no education and are available for work in both periods. The others acquire education in the

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1/ For simplicity, the formal analysis of Sections 3 and 4 focuses on the low-skill, bad-job trap as an economy-wide phenomenon; but in practice it is likely to apply only to specific sectors of the economy, since many different types of skilled labor are not substitutable for one another.

first period and are then able to provide skilled labor services in the second.

The training is useful to all firms, in the sense that it raises the workers' potential productivities at all firms equally. Nevertheless, the training is not perfectly "general" since firms have imperfect information about the availability of skilled workers. Ex post (after the skilled worker has found a skilled job), the costs of the training are shared between the employer and employee, since the wage for skilled labor exceeds that for unskilled labor. However, ex ante (when the decision to train is made), the explicit training cost falls on the worker. 1/

When workers make their training decisions and firms decide on how many skilled vacancies to create, they take account of (a) the number of trained workers, (b) the number of skilled vacancies, and (c) the wages for skilled an unskilled labor--all of which are exogenous to each individual training and vacancy decision. The wages will be shown to depend on the productivities of skilled and unskilled workers. Since we will assume constant returns to labor, these productivities do not depend on the levels of skilled and unskilled employment. Consequently, it makes no difference to this model whether wages are determined before or after the training and vacancy decisions are made.

Plausibly, the market for "bad jobs" is assumed to be perfectly competitive, whereas the market for "good jobs" is taken to be imperfectly competitive, subject to the entry barriers that give employers and employees market power in the wage determination process. On account of perfect competition, the real wage there is equal to the marginal product in the unskilled sector:

$$w_u = \alpha_u \tag{1}$$

For simplicity, assume that this wage exceeds the workers' reservation wage, so that there is no unemployment.

The skilled wage is the outcome of a Nash bargain between the firm and each of its skilled employees. Under bargaining agreement, the skilled worker receives the real wage w_s and the employer receives $\alpha_s - w_s$. Under disagreement, the skilled worker's fall-back position is w_u (from employment in the perfectly competitive unskilled sector) and the employer's fall-back position is zero. The Nash bargaining problem is thus to maximize the Nash product $(w_s-w_u)^{\mu}\cdot(\alpha_s-w_s)^{1-\mu}$ with respect to w_s, where μ is the bargaining strength of the skilled employee relative to the employer. The negotiated wage, that solves this problem, is

$$w_s = \mu\cdot\alpha_s + (1-\mu)\cdot\alpha_{\mu} \tag{2}$$

1/ Allowing firms to pay part of this explicit cost would not change the qualitative conclusions of the model.

Given these wages w_u and w_s, we now turn to the workers' training decision and the firms' skilled vacancy decision.

1. The training decision

Workers are assumed to be heterogeneous in terms of their ability to acquire education, so that the marginal skilled worker's cost of education rises with the aggregate number of workers being educated (N_s). In particular, let this cost be $e \cdot N_s^{\epsilon}$, where e and ϵ are positive constants. Once a worker has acquired education, he has a probability ρ of finding a good job and receiving the wage w_s, and a probability $(1-\rho)$ of not finding it and thus having to take a bad job with wage w_u. Thus, assuming a zero rate of time discount, the marginal skilled worker's net return from education is $\rho \cdot w_s + (1-\rho) \cdot w_u - e \cdot N_s^{\epsilon}$. This must be compared with an unskilled worker's income over the two periods: $2w_u$. In equilibrium, the marginal worker is indifferent between becoming skilled and remaining unskilled: $\rho \cdot w_s + (1-\rho) \cdot w_u - e \cdot N_s^{\epsilon} = 2w_u$, or equivalently,

$$\rho \cdot w_s - (1+\rho) \cdot w_u = e \cdot N_s^{\epsilon} \tag{3}$$

Letting V_s be the aggregate number of skilled vacancies, N_s be the aggregate number of skilled job searchers, and X_s be the aggregate number of matches, the matching technology is given in the following simple terms:

$$X_s = A \cdot \min(N_s, V_s) \tag{4}$$

where A is a constant, and $A < 1$ since skilled workers have imperfect information about the availability of skilled vacancies. 1/ Consequently the probability ρ of finding a good job is

$$\rho = \frac{X_s}{N_s} = A \cdot \min\left[\frac{V_s}{N_s}, 1\right] \tag{4a}$$

Substituting the wage equations (1) and (2), together with the probability function (4a), into the marginal condition (3), yields the "training function":

1/ Observe that since workers are assumed to live for only two periods and it takes one period to acquire education, each skilled worker works for only one period. Thus the aggregate number of skilled searchers is equal to the aggregate number of skilled workers and the aggregate number of skilled vacancies is equal to the aggregate number of good jobs.

$$A \cdot \mu \cdot (\alpha_S - \alpha_u) \cdot \frac{V_S}{N_S} - \alpha_u = e \cdot N_S^{\epsilon} \qquad for\ V_S < N_S \tag{5a}$$

$$A \cdot \mu \cdot (\alpha_S - \alpha_u) - \alpha_u = e \cdot N_S^{\epsilon} \qquad for\ V_S \geq N_S \tag{5b}$$

This training function is depicted by the TF curve in figure 1. 1/

2. The skilled vacancy decision

For simplicity, we assume that there is free entry of firms to the sector, so that the aggregate number of skilled vacancies may be determined by a zero-profit constraint. Each firm bears a fixed cost of κ_1 (a positive constant). Beyond that, firms are assumed to be heterogenous in terms of their costs of supplying vacancies, so that the marginal firm's total cost of supplying vacancies rises with the aggregate number of vacancies supplied. Let this vacancy-induced part of the total cost be $\kappa_2 . V_S^{\delta}$, where κ_2 and δ are positive constants and $\delta > 1$. Thus the average cost of the marginal firm is $(\kappa_1 / V_S) + \kappa_2 \cdot V_S^{\delta - 1}$.

Each firm has the same average return from creating a skilled vacancy, namely, $\theta \cdot (\alpha_S - w_S)$ where θ is the firm's probability of finding a skilled worker. Thus the zero profit (free entry) condition is

$$\theta \cdot (\alpha_S - w_S) = \frac{\kappa_1}{V_S} + \kappa_2 \cdot V_S^{\delta - 1} \tag{6}$$

1/ Equation (5b) pertains to the vertical part of the TF curve, lying above the 45° line, whereas equation (5a) pertain to the portion of the curve lying below the 45° line. The latter portion is convex since, along the TF curve,

$$\frac{dV_S}{dN_S} = \frac{\alpha_u + e \cdot (1+\varepsilon) \cdot N_S^{\epsilon}}{B \cdot \mu \cdot (\alpha_S - \alpha_u)}$$

where B is defined below in equation (4b).

The firm's probability of finding a skilled worker is

$$\theta = \frac{X_S}{V_S} = B \cdot \min\left[\frac{N_S}{V_S}, 1\right] \tag{4b}$$

Substituting (4b) into (6), we obtain the "skilled vacancy function":

$$\kappa_1 + \kappa_2 \cdot V_S^{\delta} = B \cdot N_S \cdot (1-\mu) \cdot (\alpha_S - a_u) \qquad \text{for } V_S > N_S \tag{7a}$$

$$\kappa_1 + \kappa_2 \cdot V_S^{\delta} = B \cdot V_S \cdot (1-\mu) \cdot (\alpha_S - \alpha_u) \qquad \text{for } V_S \leq N_S \tag{7b}$$

This vacancy function is depicted by the VF curve in Figure 1. 1/

3. The labor market equilibria

The labor market equilibria lie at the intersections of the training function and the vacancy function. Observe that a rising marginal cost of training makes the lower portion of the training function (corresponding to equation (5a)) convex, and that a rising marginal cost of vacancies makes the upper portion of the vacancy function (corresponding to equation (8a)) concave, as shown in Figure 1. Thus it is easy to see that, provided a labor market equilibrium exists, 2/ there must be exactly two equilibria. One equilibrium lies at the intersection between the upward-sloping portion of the TF curve and the horizontal portion of the VF curve. 3/ This is the "low-skill, bad-job trap." The other equilibrium lies above this trap, either at the intersection of the upward-sloping portion of the VF curve and the vertical portion of the TF curve (as depicted by the intersection of VF_1 and TF in Figure 1), 4/ or at the intersection of the upper horizontal portion of the VF curve and the upward-sloping portion of the TF curve (as

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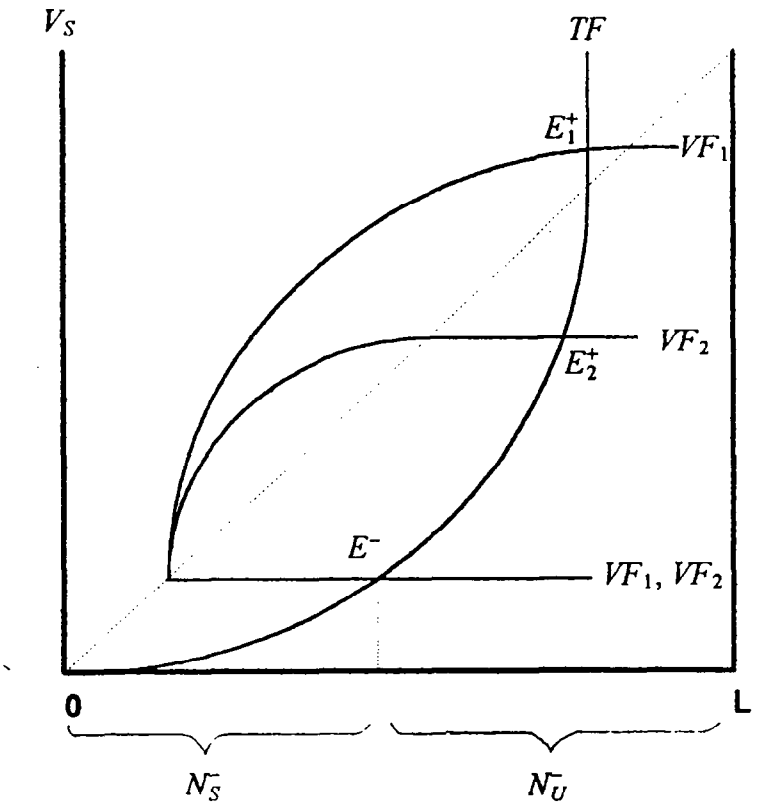
1/ Equation (7b) depicts the horizontal portion of the VF curve, lying beneath the 45° line, while equation (7b) depicts the portion lying above the 45° line. The latter portion is concave.

2/ An equilibrium exists whenever the VF curve intersects the 45° line below the point at which the TF curve intersects the 45° line.

3/ Recall that, beneath the 45° line, the TF curve *must* slope upwards while the VF curve *must* be horizontal.

4/ Recall that, above the 45° line, the VF curve *must* slope upwards while the TF curve *must* be vertical.

Figure 1. The low Skill, Bad-Job Trap and the High-Skill, Good-Job Equilibrium



depicted by the intersection of the VF_2 curve and the TF curve in the figure). This is the "high-skill, good-job equilibrium."

Observe that the greater is the number of skilled workers and skilled vacancies in our model, the greater is the income that workers receive (since skilled workers receive higher wages than unskilled ones) and the greater is the total profit earned by firms (since profits are earned only from the imperfectly competitive, skilled jobs). As skilled workers are more productive than unskilled ones, a greater number of skilled workers means that more is being produced in the sector. In this sense, therefore, assuming quite plausibly that skilled work is not more onerous that unskilled work, it is in the public interest to attain the high-skill, good-job equilibrium and to avoid the low-skill, bad-job trap.

From the marginal training condition (3) we infer that for all points lying above the training function TF in the figure, the expected marginal gain from training $(\rho \cdot w_s - (1+\rho) \cdot w_u)$ exceeds the associated marginal cost $(e \cdot N_s^{\epsilon})$, and thus the supply of skilled workers will increase; conversely, for all points lying below TF, the supply of skilled workers falls. Moreover, from the free entry condition (6) we infer that for all points lying below the vacancy function VF in the figure, the expected average gain $(\theta \cdot (\alpha_s - w_s))$ from supplying vacancies exceeds the associated average cost $(\kappa_1/V_s + \kappa_2 V_s^{\delta-1})$ and thus the supply of vacancies will increase; and conversely, for all points lying above VF, the supply of vacancies rises. For these reasons, the two equilibria in Figure 1 are stable.

At the low-skill, bad-job trap, few workers acquire education since there are few skilled vacancies, and firms supply few skilled vacancies because there are few educated workers. Thus skilled employment is N_s^- and, given that the labor force is constant at L, unskilled employment is $N_u^- = L - N_s^-$. At the high-skill, good-job equilibrium, skilled vacancies are plentiful and so many workers acquire education, and since many workers are educated, firms offer many skilled vacancies.

IV. Policy Implications

Regarding policy formulation, it is important to recall that there are two reinforcing externalities in the model above, a "vacancy supply

externality" and a "training supply externality". 1/ The vacancy supply externality is implicit in the training decision described by equation (3). The greater is the aggregate number of skilled vacancies, the greater will be the probability that a skilled worker finds a good job (provided that $\theta<1$) and thus the greater will be the expected return from training. Thus when a firm creates new vacancies, its private return falls short of the social return, since the latter also includes the rise in the workers' expected return from training.

The training supply externality is implicit in the vacancy decision described by equation (6). The greater is the aggregate number of skilled workers, the greater will be the probability that a firm with a good job finds a skilled worker to fill it (provided that $\theta<1$)and thus the greater will be the expected return from supplying vacancies. Thus when a worker acquires education, his private return falls short of the social return, which also includes the increase in the firms' expected gain from supplying vacancies.

Each of these externalities in isolation would lead the market mechanism to provide insufficient training. When both externalities are present simultaneously, as in the model above, the market failure is considerably amplified. This is the case not only for the low-skill, bad-job trap, but also for the high-skill, good-job equilibrium. Consequently, in the absence of major government failures in this area, there is a strong case for the government to stimulate the acquisition of skills.

In the context of the model, there are two straightforward ways of doing this: either through an education subsidy to the workers or a skilled employment subsidy to the firms. The former shifts the training function rightwards (as when a proportional education subsidy reduces the parameter e of the training cost in equation (3)); the latter shifts the vacancy function upwards (as when a proportional employment subsidy reduces the parameter κ_2 of the vacancy supply cost in equation (6)).

1/ For completeness, note that there are two further externalities as well: (i) when a firm creates a new vacancy, it reduces other firms' returns from creating new vacancies (since it thereby reduces the other firms' probability of finding skilled workers) and (ii) when a worker acquires training, he reduces other workers' returns from training (since he thereby reduces the other workers' probability of finding skilled vacancies). It is easy to see, however, that these two externalities are less than unity (viz, when a firm creates a new vacancy, the other firms have an incentive to reduce their supply of vacancies by less than unity; when a worker acquires training, the other workers have an incentive to reduce their training by less than that), but the multiplier effects from the vacancy supply externality and the training supply externality are greater than or equal to unity (as is clear form the figure).

Both subsidies induce workers to acquire more skills when the sector is in the low-skill, bad-job trap. However--and this is the important point--the analysis above indicates that the two approaches are not equally effective in creating skilled employment. Given that the proximate effect of the education subsidy is to increase the number of workers receiving training, the low-skill, bad-job equilibrium will merely shift horizontally rightward in the figure. Thus the workforce becomes more skilled but no extra jobs are generated. 1/ On the other hand, the skilled employment subsidy creates jobs by stimulating both the supply of vacancies *and* the supply of skilled workers.

Furthermore, the skilled employment subsidy--by shifting the VF curve upwards along the 45° line--brings the low-skill, bad-job trap into progressively closer proximity to the high-skill, good-job equilibrium. The education subsidy does not have this effect: the distance between the two equilibria either increases (as at the intersection between the VF_1 and TF curves) or remains unchanged (as at the intersection between the VF_2 and TF curves).

Finally, since both equilibria are stable, "small" subsidies are not sufficient to overcome the low-skill, bad-job trap. A "big push"--in the form of sufficiently large skilled employment subsidies--is required before the sector can be propelled toward the high-skill, good-job equilibrium.

1/ Given the matching function (4), the number of matches remains unchanged since the number of vacancies remains unchanged.

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