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**Working Paper — Digitized Version**

## Segmented labor markets and unemployment

Seminar paper, Institute for International Economic Studies, University of Stockholm, No. 483

**Provided in Cooperation with:**

Kiel Institute for the World Economy – Leibniz Center for Research on Global Economic Challenges

*Suggested Citation:* Lindbeck, Assar; Snower, Dennis J. (1990) : Segmented labor markets and unemployment, Seminar paper, Institute for International Economic Studies, University of Stockholm, No. 483, Institute for International Economic Studies, University of Stockholm, Stockholm

This Version is available at:

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ISSN 0347-8769

Seminar Paper No. 483

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by

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1991 K 1001

Seminar Papers are preliminary material circulated to stimulate discussion and critical comment.

November 1990

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## SEGMENTED LABOR MARKETS AND UNEMPLOYMENT

by Assar Lindbeck and Dennis J. Snower

This paper suggests various alternatives to the Harris-Todaro theory in explaining unemployment in segmented labor markets. We focus on a labor market with a perfectly competitive secondary sector and an imperfectly competitive primary sector, the latter combining salient features of the efficiency wage, insider-outsider, and bargaining theories of employment and wage formation. Unemployment and labor market segmentation are explained with reference to heterogeneous preferences, productivities, and endowments among workers. The responsiveness of unemployment to external shocks is shown to depend crucially on whether the above heterogeneities are exogenously given or whether they are endogenously generated through workers' employment histories.

### 1. Introduction

Theories of non-market-clearing wage setting (e.g. efficiency wage, insider-outsider, union, and wage bargaining theories) provide a self-contained explanation of unemployment only in the context of hypothetical labor markets where all jobs have wages that are above their market-clearing levels. In practice, however, most labor markets contain not only imperfectly competitive sectors - for which the non-market-clearing models above have been designed - but also competitive sectors where wages bring labor demand into equality with labor supply. The distinction between "primary" and "secondary" labor markets is of course based on this observation.

For labor markets of this sort, the existence of primary-sector wages above their market-clearing levels does not necessarily imply the presence of unemployment: while such wages can explain why labor demand falls short of labor supply in the primary sector, they cannot explain why workers choose to remain unemployed rather than work in the secondary sector. The latter choice is not a direct outcome of primary-sector wage determination, but lies in the hands of the workers who are not in the primary sector.

A recent literature (e.g. Bulow and Summers (1986), McDonald and Solow (1985), Dickens and Lang (1988)) has attempted to merge analyses of non-market-clearing wages in the primary sector with those of

secondary-sector employment and unemployment, thereby providing a rationale for the joint occurrence of unemployment and labor market segmentation. It is striking that most contributions in this field explain unemployment in terms of the Harris-Todaro theory.<sup>1</sup>

This theory has remarkable implications for the way in which unemployment reacts to variations in primary-sector employment. In most efficiency wage, insider-outsider, and union models of unemployment, a secondary sector is not considered and workers are either unemployed or employed in the primary sector. Here a rise in primary-sector employment invariably leads to a fall in unemployment. In the Harris-Todaro model, by contrast, a rise in primary-sector employment (that is associated with a rise in primary-sector labor income) invariably leads to a rise in unemployment. The reason, of course, is that the increase in primary-sector employment raises the expected return from being unemployed (and searching for primary-sector jobs) relative to the return from working in the secondary sector (and not searching for primary-sector jobs). Empirical evidence, however, does not support the Harris-Todaro prediction that there is always an inverse relation between unemployment and primary-sector employment.

This paper begins by setting out serious misgivings concerning the cogency of the Harris-Todaro theory as an explanation of unemployment in segmented labor markets, and we then proceed to suggest various alternatives to this theory. For simplicity, we will restrict our analysis to a dual labor market, with a perfectly competitive secondary sector and an imperfectly competitive secondary sector. (However, as will become clear later, it is easy to extend our analysis to many sectors.) Since we do not wish to pin our analysis to any individual theory of primary-sector wage and employment decisions, our model of the primary sector combines salient characteristics of

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<sup>1</sup>For an overview, see Dickens and Lang (1988). Bulow and Summers (1986) describe the primary sector in terms of the efficiency wage theory, whereas McDonald and Solow (1985) describe it in terms of the labor union theory; but unemployment in both models is generated by the Harris-Todaro assumption that only the unemployed are capable of searching for primary jobs.

the efficiency wage, insider-outsider, and bargaining theories.<sup>2</sup> Our suggested alternatives to the Harris-Todaro theories do not imply that unemployment always varies inversely with the level of primary-sector employment, but rather suggests that the relation could be either positive, zero, or negative, depending on the sources of labor market segmentation.

The rest of the paper is organized as follows. Section 2 deals with the Harris-Todaro theory and its current alternatives. The rest of the paper is concerned with our proposed alternatives. Section 3 presents our model of the primary and secondary sectors and the unemployment pool. Section 4 presents our three alternatives to the Harris-Todaro explanation of unemployment in segmented labor markets. Section 5 concludes.

## 2. The Harris-Todaro Theory and Its Current Alternatives

### *2a. Misgivings about the Harris-Todaro Theory of Unemployment*

The Harris-Todaro theory, as is well known, assumes that the unemployed are better able to search for primary-sector jobs than are the the secondary-sector workers, and it predicts that unemployment tends to the level at which the expected returns from secondary-sector employment and from unemployment are equalized. The theory was originally proposed to explain rural migration and urban unemployment in developing countries.<sup>3</sup> A prominent shortcoming of the theory is that primary- and secondary-sector jobs generally exist in close proximity to one another. In developing countries, the urban areas do not offer only high-wage jobs, but many low-wage ones as well. Similarly, in developed countries, the primary and secondary jobs are generally not geographically separated. Thus it certainly cannot be argued that workers who are queuing for primary jobs have no choice... but to remain unemployed. The question that then remains unanswered is why some workers choose to remain unemployed rather than to accept

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<sup>2</sup>Although labor unions are not explicitly considered, it is easy to incorporate them in our analysis as well.

<sup>3</sup>See Harberger (1971) and Harris and Todaro (1970).

secondary jobs while waiting for primary ones.

The usual argument that workers in secondary employment are unable to search as efficiently as those who are unemployed is not compelling. The early contributors to the job search literature (e.g. Alchian (1970), Mortensen (1970)) rationalized this argument with the observation that unemployed workers have more time available for job search than their employed counterparts. Yet the empirical evidence indicates that the unemployed do not make much use of this advantage: unemployed workers appear to spend remarkably little time searching for jobs and generate remarkably few job applications in the process.<sup>4</sup> There also appears to be little, if any, correlation between search intensity and unemployment duration,<sup>5</sup> perhaps suggesting that the opportunity to spend time and money on search does not play a major role in finding jobs. If this is true, it would suggest that time constraints in job search do not have a large effect on job acquisition. Moreover, the evidence indicates that most of the unemployed search through channels that are easily available to job

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<sup>4</sup>For example, Jackman (1983) finds that the median unemployed worker in the UK spends an average of 5 hours per week searching for employment - a time span that employed workers could easily afford to spend as well (source: Gazette, Jan. 1981). The median number of job applications is 1 per month. For the US, the Monthly Labor Review (Nov. 1977) also finds a median search time of approximately 5 hours. Harald Lang has informed us that Swedish panel data reveals about the same figure. Note, however, that these figures underestimate the average amount of search time by unemployed workers if those workers who spend comparatively much time searching spend a comparatively short time in the unemployment pool. On the other hand, see the next footnote.

<sup>5</sup>For the UK, Jackman (1983) finds that the long-term and short-term unemployed spend about the same amount of time and financial resources on job search. The Bureau of Labor Statistics (Bulletin 1886, 1975) also finds no correlation between time spent searching and unemployment duration.

holders.<sup>6</sup>

If unemployment were predominantly the outcome of a voluntary decision motivated by the need to search more effectively, then we might expect the unemployment rate to be particularly high among prime-age, non-minority males, since their jobs are characterized by high wage dispersion and long job tenure and thus their returns from search should be particularly large. In fact, however, these people have the lowest unemployment rate.<sup>7</sup>

Contrary to the thrust of the Harris-Todaro theory, a large fraction of people who change jobs in practice do not go through an intervening period of unemployment; on-the-job search is very common. For example, Pissarides and Wadsworth (1988) show that in the UK most labor turnover takes the form of job-to-job changes. Clark and Summers (1979) make a similar observation for the US.<sup>8</sup> Moreover, on-the-job search in the secondary sector appears to be more common than in the primary sector.<sup>9 10</sup>

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<sup>6</sup>For example, Clark and Summers (1979) find that most successful job seekers in the US locate employment through friend and relatives or through want ads, while only a minority (35%) do so through direct application to employers. For the UK, Jackman (1983) indicates that most of the unemployed find jobs through word of mouth, newspapers, and public employment agencies, while only 15% find them through direct contact with employers.

<sup>7</sup>It might, of course, be argued that their costs of job search are significantly higher than among other population groups, but not clear why this should invariably be so.

<sup>8</sup>In particular, they indicate that 54% of all US workers who change jobs do not experience unemployment.

<sup>9</sup>Pissarides and Wadsworth (1988) show that workers in temporary or part-time jobs are more likely to search than those with permanent jobs.

<sup>10</sup>It is important to note, however, that there is also a substantial body of evidence that most job searchers are unemployed. Yet this need

For all these various reasons, it appears most unlikely that the bulk of unemployment in developed and developing countries is due to an advantage the unemployed workers have over the secondary-sector employees in searching for primary-sector jobs. Yet once this assumption is dropped, the Harris-Todaro rationale for unemployment disappears. Hence there appears to be a strong case for seeking alternatives to the Harris-Todaro explanation of unemployment in segmented labor markets.

## *2b. Salient Features of the Harris-Todaro Model*

To assess the significance of our suggested alternatives, it is convenient to compare them with the salient features of the Harris-Todaro model, as summarized in Figure 1. Here the total labor force,  $\bar{N}$ , is taken to be a constant and is measured on the horizontal axis. Aggregate labor demand by the primary sector is depicted by the  $E_p$  curve (where "E" stands for "employment" and "p" for "primary sector"). Given an exogenous primary-sector real wage,  $\bar{w}_p$ , the level of primary-sector employment is  $N_p^*$ . For simplicity, let the marginal revenue product of labor in the secondary sector be constant at  $a_s$ . Assuming that secondary-sector wages are market-clearing and that secondary-sector workers are unable to find jobs in the primary sector,  $a_s$  may be interpreted as the return to secondary-sector

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not imply that the unemployed have more favorable search opportunities than workers in the secondary sector. There are many other, more plausible, reasons for this pattern. First, the unemployed workers search for both the secondary- and primary-sector jobs, while many secondary-sector workers may concentrate on the primary sector. Second, some of the secondary-sector employees are presumably unqualified to work in the primary sector, whereas this presumption may well be weaker with regard to the unemployed workers. Lastly, compared to the secondary-sector workforce, the unemployment pool is likely to contain a comparatively high proportion of workers (e.g. university graduates, workers dismissed from primary jobs) who find secondary-sector employment particularly onerous and who are thus likely to search particularly intensively. For these reasons, it seems foolhardy to assume that differential search patterns between unemployed and secondary-sector workers are all due to differential search opportunities.



employment. Moreover, assuming that unemployed workers do have the opportunity of finding primary-sector jobs, the expected return to unemployment (denoted by  $R_u$  in the figure) is a downward-sloping function of the level of unemployment, since a rise in unemployment (measured from right to left in the figure) reduces each worker's probability of finding primary-sector employment. The equilibrium level of unemployment can then be depicted by the intersection of the  $a_s$  and  $R_u$  curves (i.e. equality between the returns from secondary-sector employment and unemployment).

An improvement in primary-sector employment - generated, say, by a rightward shift of the primary-sector labor demand curve  $E_p$  at constant real wage  $\bar{w}_p$  raises the return to unemployment (i.e. shifts the  $R_u$  curve to the left) and consequently induces more people to enter the unemployment pool. This comparative static experiment highlights an important feature of the Harris-Todaro model: the level of unemployment is not independent of the level of primary-sector employment; in short, there is no "dichotomy" between the primary-sector and the unemployment pool. The well-known policy implication is that urban development can be expected to exacerbate - rather than diminish - the level of unemployment. To reduce unemployment, rural productivity ( $a_s$ ) and employment prospects must be improved through rural development.

### *2c. Alternatives to the Harris-Todaro Theory of Unemployment*

A different approach to the analysis of unemployment in segmented labor markets is contained in the early literature on labor market segmentation (e.g. Doeringer and Piore (1971), Harrison (1972), Piore (1969), Thurow (1972)). Here, secondary-sector workers may be at a disadvantage in seeking primary-sector jobs, because secondary-sector employment "scars" workers, by reducing their trainability, adaptability, punctuality, and desire for stable employment. There does not, however, appear to be any evidence to suggest that workers are more badly "scarred" by secondary-sector jobs than by unemployment.

According to Marxist contributors to the segmented labor market literature (e.g. Edwards, Reich, and Gordon (1975) and Marglin (1974)), labor market segmentation is the outcome of employers' collective, class-based ambitions to "deskill" and "exploit" their workers. This approach, like the rest of the early segmentation literature, has not been rationalized in terms of optimizing decisions

by microeconomic agents.

Yet another tack is taken by Gottfries and McCormick (1989) and McCormick (1990), who argue that unemployment may be a signal of high productivity. The reasoning is that primary-sector firms screen their job applicants (in Gottfries and McCormick) and that the high-productivity workers find primary-sector (skilled) work more satisfying than do low-productivity workers, thereby leading the low-productivity workers to enter the secondary sector, rather than remain unemployed and queue for primary-sector jobs. This argument may be ingenious, but it is also unconvincing. In practice, there are clearly many reasons - other than high productivity (!) - to induce workers to join the unemployment pool. One particularly important one is that unemployed workers may not find it worthwhile to work in the secondary sector since their productivities (and hence their prospective wages) are less than those of the secondary-sector employees and that they consequently prefer to live on unemployment benefits or transfers from family or friends. Moreover, a case could be made that since unemployed workers are less accustomed to work than their secondary-sector counterparts, they may be less dependable, less punctual, and more difficult to motivate. In any case, there is no evidence to suggest that firms presume the unemployed workers to be more productive than those performing secondary-sector jobs.<sup>11</sup>

In the following sections, we present other alternatives to the Harris-Todaro theory, ones which attempt to avoid the deficiencies above. Of the three alternatives to the Harris-Todaro model developed below, one features a dichotomy between the primary-sector and the unemployment pool. In the other two, this dichotomy does not exist, but the relation between primary-sector employment and unemployment may be either positive (as in the Harris-Todaro model) or negative. Clearly, the sign of this relation implies whether urban development (involving the creation of new primary-sector jobs) will reduce or amplify the unemployment problem.

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<sup>11</sup> Another explanation of labor market segmentation is contained in Weitzman's (1989) model, where firms offering high wages receive a more reliable supply of labor. This analysis is more compatible with conditions of excess labor demand than with chronic unemployment.

### 3. The Underlying Model

#### 3a. The Primary Sector

To begin with, it is important to observe different theories of non-market-clearing wages define the "primary sector" in quite different ways. For example, in the labor union theory (e.g. McDonald and Solow (1985)), it is the sector in which workers are unionized; in the efficiency wage theory (e.g. Bulow and Summers (1986)), it is the one in which firms have imperfect information about workers' productivities and use wages as screening device for these productivities; in the insider-outsider theory (e.g. Lindbeck and Snower (1989, ch.11)), it is the one in which there are substantial labor turnover costs and insiders have market power. Insofar as our analysis contains elements of all these theories, the "primary sector" will here be defined as the one which has one or more of the features above.

Let the primary sector contain a fixed number ( $F$ ) of identical firms. The wage-employment decisions in each firm are made in two stages: first the nominal wages are set through bargains between each firm and its employees, given full information about the employment repercussions; then each firm makes its employment decision, taking the nominal wage as given. For simplicity, but without loss of generality, we assume that firms are price takers in the product market. Then bargaining over the nominal wage is equivalent to bargaining over the real wage. Accordingly, we first examine the firms' employment-decisions under predetermined real wages, and then analyze real wage formation.

#### (i) Employment Decisions

Our analysis of employment decisions seeks to encompass prominent features of both the efficiency wage and insider-outsider theories. Let each primary-sector firm produce a nondurable, homogeneous good ( $q_p$ ) by means of a homogeneous labor input ( $n_p$ ). (The subscript "p" stands for "primary sector".) Let  $e$  be the "average productivity coefficient", representing the average effort and skill level of the firm's workforce. Let the firm's production function take a

Cobb-Douglas form:<sup>12</sup>

$$(1) \quad q_p = A \cdot (n_p \cdot e)^\alpha,$$

where  $A (>0)$  and  $\alpha (0 < \alpha < 1)$  are constants.

The firm is assumed unable to observe each worker's productivity directly, but uses the real wage  $w_p$  as a screening device for this purpose. For simplicity, let the relation between the average productivity coefficient  $e$  and the wage be given by<sup>13</sup>

$$(2) \quad e = w_p^\beta,$$

where  $\beta$  is a constant,  $0 \leq \beta < 1$ , measuring the responsiveness of the productivity coefficient to the wage. When  $\beta > 0$  the wage may be used as an incentive device and thus efficiency wage considerations become relevant; when  $\beta = 0$  these consideration are irrelevant and labor demand is determined by the standard marginal productivity conditions.

For simplicity, suppose that the firm faces a constant real firing cost  $\bar{f}$  per worker fired and a constant real hiring cost  $\bar{h}$  per worker hired. Let  $m_p$  be the firm's insider workforce.<sup>14</sup> Then the firm's real profit is

$$(3) \quad \pi_p = A \cdot n_p^\alpha \cdot w_p^{\alpha\beta} - w \cdot n_p - h \cdot (n_p - m_p) - f \cdot (m_p - n_p)$$

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<sup>12</sup>This is not an assumption of substance; our analysis merely requires that there be positive, diminishing returns to labor.

<sup>13</sup>In many versions of the efficiency wage theory (e.g. Shapiro and Stiglitz (1984), the productivity coefficient also depends positively on the unemployment rate. As will become clear later, the inclusion of this latter variable would make no substantive difference to our qualitative conclusions.

<sup>14</sup>This workforce is historically given. Specifically, it is equal to last period's insider workforce plus the number of previous entrants who currently gain insider status, minus the number of insiders who retired in the previous period.

where  $h = \bar{h}$  for  $n_p > m_p$  and  $h = 0$  otherwise, and  $f = \bar{f}$  for  $m_p > n_p$  and  $f = 0$  otherwise. The firm maximizes this profit function with respect to  $n_p$ , taking the wage  $w_p$  as given. The resulting labor demand function is

$$(4) \quad n_p^* = \left[ \frac{w_p + h - f}{A \cdot \alpha \cdot w_p^{\alpha\beta}} \right]^{-\frac{1}{1-\alpha}}$$

Since there are  $F$  identical firms in the primary sector, aggregate employment is

$$(5) \quad N_p^* = F \cdot \left[ \frac{w_p + h - f}{A \cdot \alpha \cdot w_p^{\alpha\beta}} \right]^{-\frac{1}{1-\alpha}}$$

It is easy to verify that aggregate employment is inversely related to the real wage, as illustrated by the  $E_p$  curve in Figure 2 (where  $E_p$  stands for "employment in the primary sector"). Along the top segment of the  $E_p$  curve, where  $N_p < F \cdot m_p$ , the firm fires insiders but hires no new entrants; thus the real wage is set equal to the marginal product of labor plus the marginal firing cost. Along the bottom segment of the  $E_p$  curve, where  $N_p > F \cdot m_p$ , the firm hires new entrants and retains its insiders; thus the real wage plus the marginal hiring cost is set equal to the marginal product of labor. Finally, the vertical segment of the  $E_p$  curve is the "area of inactivity": the firm fires no insiders and hires no entrants, and the real wage is less than the marginal product plus the firing cost and greater than the marginal product minus the hiring cost.

## (ii) Wage Decisions

Current theories of non-market-clearing wages may be divided into three groups: (i) those focusing on market power of firms (e.g. the efficiency wage theory), where it is in the firms' interests to drive wages above their market-clearing levels, (ii) those resting on the market power of workers (e.g. the labor union and insider-outsider theories), where it is in the workers' interests to do so, and (iii) bargaining theories, where both firms and workers exercise market power. Our analysis of wage formation is based on a simple bargaining

framework that contains important elements of both the "firm-power" and the "worker-power" theories.

Let the primary-sector real wage ( $w_p$ ) be the outcome of a generalized Nash bargain between every firm and each of its insiders (who are each assumed to provide one unit of labor time per period). Specifically, letting  $\phi(w_p)$  be the bargaining objective of the insider and  $\psi(w_p)$  be that of the firm, the real wage is given as the solution to the following problem:

$$(6) \quad \underset{w_p}{\text{Maximize}} \quad \Omega = \phi^\mu \cdot \psi^{1-\mu},$$

where  $\mu$  is a constant ( $0 \leq \mu \leq 1$ ) that stands for the bargaining strength of the insider relative to that of the firm.

The first-order condition for an interior solution ( $\partial\Omega/\partial w_p = 0$ ) is

$$(7) \quad [\mu/(1-\mu)] \cdot \psi = -[\psi_w/\phi_w] \cdot \phi,$$

where  $\psi_w = (\partial\psi/\partial w_p)$  and  $\phi_w = (\partial\phi/\partial w_p)$ . In other words, the wage is set so that value of the firm's objective ( $\psi$ ) is positively related to the value of the insider's objective ( $\phi$ ), with the relation depending on the relative bargaining strengths  $[\mu/(1-\mu)]$  and the relative responsiveness of the two objectives to the wage  $[\psi_w/\phi_w]$ .

We now specify the two bargaining objectives. The insider is assumed to maximize his "utility surplus", i.e. the difference between his utility under agreement (which is taken to be  $w_p$ ) and his utility under disagreement ( $z$ , the threat-point wage) in the wage negotiations.  $z$  is taken to be a constant in the bargaining process; we will consider its determinants later. In short, the insider's utility surplus is

$$(8) \quad \phi = w_p - z.$$

The firm's objective is assumed to be the maximization of the "profit surplus" generated by the insider, i.e. the difference between the profit generated by the insider under agreement and under disagreement, taking the real wage and employment of all other insiders as given. Given that the firm's insider workforce ( $m_p$ ) is sufficiently large, the output generated by the insider - taking the real wage  $\bar{w}_p$  and employment of the other insiders as exogenously given

- may be approximated by  $(\partial q_p / \partial m_p) = A \cdot \alpha \cdot (m_p \cdot \bar{w}_p^\beta)^{-(1-\alpha)} \cdot w_p^\beta$ . Thus the profit generated by the marginal insider under agreement is  $(a \cdot w_p^\beta - w_p)$ , where  $a = A \cdot \alpha \cdot (m_p \cdot \bar{w}_p^\beta)^{-(1-\alpha)}$  is exogenously given to the bargaining process. Assuming that the insider generates no profit under disagreement (say, on account of strikes or working-to-rule),<sup>15</sup> then the firm's profit surplus is

$$(9) \quad \psi = a \cdot w_p^\beta - w_p.$$

Substituting the insider's utility surplus (8) and the firm's profit surplus (9) into the bargaining condition (7), we obtain the following expression for the negotiated wage ( $\hat{w}_p$ ):

$$(10) \quad \hat{w}_p = [(\mu) \cdot a \cdot (\hat{w}_p)^\beta + (1-\mu) \cdot r] + [(1-\mu) \cdot (\hat{w}_p - z) \cdot a \cdot \beta \cdot (\hat{w}_p)^{\beta-1}].$$

Express the threat-point wage in terms of the "loss ratio"<sup>16</sup>  $\theta$ :  $z = \theta \cdot w_p$ ; let  $\delta = (1-\theta)$  be the proportional wage differential  $(w_p - z)/w_p$ , and define  $\sigma = [\mu/(1-\mu)]$  as a measure of relative bargaining strength. Then it can be shown that the negotiated wage may be written as follows:<sup>17</sup>

$$(11) \quad \hat{w}_p = \left[ \frac{a \cdot (\sigma + \delta \cdot \beta)}{\sigma + \delta} \right]^{\frac{1}{1-\beta}}.$$

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<sup>15</sup>In line with the insider-outsider theory, we assume that the firm's cost of firing an insider is sufficiently high so as to induce the firm to keep the insider's position vacant during disagreement.

<sup>16</sup>This ratio measures the loss to the worker of switching from the negotiated wage  $w_p$  to the threat-point wage  $z$ .

<sup>17</sup>Observe that when the firm has complete market power ( $\sigma=0$ ), we are in the realm of the efficiency wage theory alone, and the wage outcome reduces to  $\hat{w}_p = [a \cdot \beta]^{1/(1-\beta)}$ , which is the wage that maximizes the profit generated by the insider. On the other hand, when the insider has complete market power ( $\sigma=\infty$ ), the wage becomes  $\hat{w}_p = a^{1/(1-\beta)}$ , which is the wage that reduces the profit from the insider to zero.

Note that the negotiated wage  $\hat{w}_p$  rises when

- $a$  rises (a favorable productivity shock),
- $\delta$  falls (a rise in the replacement ratio,  $\theta$ ),
- $\sigma$  rises (an increase in the bargaining strength of the insider relative to the firm), and
- $\beta$  rises (an increase in the responsiveness of effort to the wage).

Moving from the microeconomic level to the aggregate primary labor market, we assume that the loss ratio depends positively on the aggregate level of employment ( $N_p$ ) in the primary sector:  $\theta = \theta(N_p)$ ,  $\theta' > 0$ . Our rationale is standard: in case of disagreement during wage negotiations, the insiders are assumed to seek other vacant job slots in the primary sector, and the probability of finding these vacancies (as our analysis below shows) depends on the aggregate level of primary-sector employment. Consequently, the proportional wage differential  $\delta = (w_p - z)/w_p$  depends inversely on the level of primary-sector employment:

$$(12) \quad \delta = 1 - \theta(N_p) = \delta(N_p), \quad \delta' < 0.$$

The wage negotiators take the employment level  $N_p$  to be exogenously given during the wage setting process, so that  $\delta$  is an exogenous parameter in the wage setting equation (11).

All workers in each firm are assumed to receive the same real wage.<sup>18</sup> In equilibrium,  $\bar{w}_p = \hat{w}_p$  (i.e. the negotiated wage  $\hat{w}_p$ , which is

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<sup>18</sup>Thus, whereas only the firm and its insiders have a say in setting the real wage, all workers (including the new entrants, who have not yet gained insider status) receive that wage. This arrangement can be rationalized in various ways which, however, lie outside the specific model in the text. For example, in the spirit of Akerlof (1982) and Akerlof and Yellen (1988), it may be argued that since unequal pay for equal work would be considered unfair by the employees and lead to a reduction in work effort, the firm has an incentive to pay comparable wages to its insiders and entrants. Alternatively, in the spirit of Lindbeck and Snower (1988), one could argue that the firm has such an incentive because the insiders have an individualistic incentive to refuse to "cooperate" with underbidding entrants in the process of production and to "harass" them, thereby reducing the potential



determined on the basis of a given wage  $\bar{w}_p$ , received by all other insiders, is itself equal to  $\bar{w}_p$ . Recalling that  $a = A \cdot \alpha \cdot (m \cdot \bar{w}_p^\beta)^{-(1-\alpha)}$  and substituting this into the wage equation (11), we obtain the equilibrium real wage  $w_p^*$  ( $= \bar{w}_p = \hat{w}_p$ ):

$$(13) \quad w_p^* = [A \cdot \alpha \cdot m^{-(1-\alpha)}]^{1/(1-\alpha \cdot \beta)} \cdot \left[ \frac{\sigma + \delta(N_p) \cdot \beta}{\sigma + \delta(N_p)} \right]^{1/(1-\alpha \cdot \beta)}.$$

Observe that the equilibrium real wage ( $w_p^*$ ) depends positively on the aggregate level of primary-sector employment ( $N_p$ ). The corresponding "wage setting function", is pictured by the  $WS_p$  curve in Figure 2.

The intersection of the primary-sector employment curve ( $E_p$ ) and the wage setting curve ( $WS_p$ ) in Figure 1 yields the equilibrium real wage ( $w_p^*$ ) and equilibrium employment level ( $N_p^*$ ) in the primary sector.<sup>19</sup>

### 3b. The Secondary Sector and the Unemployment Pool

We assume that work is a discrete activity, so that workers can be either unemployed or employed in the primary or secondary sector (but cannot be in more than one of these states at the same time). Furthermore, the size of the aggregate workforce is taken to be constant, at  $\bar{N}$ . Since  $N_p^*$  workers are employed in the primary sector, there are  $(\bar{N} - N_p^*)$  "unprivileged" workers in the secondary sector and the unemployment pool.

The division of the unprivileged workers between secondary-sector employment and unemployment depends on their relative benefits from these two states. To fix ideas, we formulate these benefits simply as follows.

Let  $a_s[i]$  be the marginal product of worker  $i$  in the secondary sector. Since the secondary sector is perfectly competitive, the worker's real wage ( $w_s[i]$ ) is

$$(14) \quad w_s[i] = a_s[i].$$

Let worker  $i$ 's total income in the secondary sector be  $w_s[i] + x[i]$ , where  $x$  is his non-wage income. His disutility from working in the secondary sector (i.e. providing one unit of work to that sector) is

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entrants' productivity and raising their disutility of work.

<sup>19</sup> Note that as the  $E_p$  and  $WS_p$  curves are illustrated in the Figure 1, the equilibrium is characterized by hiring of new entrants and retention of insiders.

$e_s$ , a constant. We assume that he cannot transfer his purchasing power from one period to the next, so that he consumes his entire income. His current utility from secondary-sector employment is  $\Gamma(a_s[i] + x[i], e_s[i])$ , where  $\Gamma_1 > 0$ ,  $\Gamma_2 < 0$ .

The benefit the worker derives from secondary-sector employment depends not only on his current utility, but also on his chances of entering the primary sector in the future. To capture this latter element in the simplest possible way, we assume that the worker has a two-period time horizon and that primary-sector vacancies arise on account of attrition among employees. Specifically, we suppose that each worker in the primary sector has a probability  $\theta$  ( $0 < \theta < 1$ ) of surviving from one period to the next.<sup>20</sup> Thus  $(1-\theta) \cdot N_p$  vacancies open up in the primary sector in each period.

Suppose that worker  $i$  searches for a primary-sector job while being employed in the secondary sector, and let his probability of finding a primary-sector job (to be derived below) be  $\rho$ , which he takes to be exogenously given.<sup>21</sup> His per-period utility from working in the primary sector would be  $\Gamma(w_p + x[i], e_p[i])$ , where  $e_p[i]$  is the disutility of working in the primary sector. (For simplicity,  $w_p$  and  $\rho$  are assumed to be uniform across workers.)

Thus the present value the worker's utility in the secondary sector is

$$(15) \quad V_s[i] = \Gamma(a_s[i] + x[i], e_s[i]) \\ + \delta \cdot \theta \cdot \{ \rho \cdot [\Gamma(w_p + x[i], e_p[i])] \\ + (1-\rho) \cdot [\Gamma(a_s[i] + x[i], e_s[i])] \}.$$

A worker in the unemployment pool receives an unemployment payment  $b$ , fixed in real terms. Worker  $i$ 's current income when unemployed is  $b + x[i]$  (the unemployment benefit plus his non-wage income). Let  $e_u[i]$  be his net disutility from being unemployed (e.g.

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<sup>20</sup>In order for the aggregate labor force to remain constant, we assume that new workers enter the labor force at the same rate at which others retire from it.

<sup>21</sup>We implicitly assume that his costs of job search are sufficiently low to make search for a primary-sector job worthwhile. Assuming the opposite in our model is equivalent to assuming that  $\rho_s = 0$ .

the disutility due to loss of status and inactivity, minus the utility from leisure activities). The worker also searches for a job in the primary sector and, in the absence of Harris-Todaro considerations, his probability  $\rho$  of finding one is equal to the employment probability faced by the secondary-sector worker. Hence the present value of worker  $i$ 's utility from unemployment is

$$(16) \quad V_u[i] = \Gamma(b + x[i], e_u[i]) \\ + \delta \cdot \theta \cdot \{ \rho \cdot [\Gamma(w_p + x[i], e_p[i])] \\ + (1-\rho) \cdot [\Gamma(b + x[i], e_u[i])] \}.$$

The worker will join the secondary sector when  $V_s[i] > V_u[i]$ , and remain unemployed whenever  $V_u[i] > V_s[i]$ .

To account for the division of the aggregate workforce between secondary-sector employment and unemployment, we will assume that workers differ in terms of their preferences ( $e_s$  and  $e_u$ ), productivities ( $a_s$ ), and endowments ( $x$ ).<sup>22</sup> The next section presents three models of unemployment and labor market segmentation based on these heterogeneities. In the first model, the heterogeneities are assumed to be exogenously given; in the next two, workers' secondary-sector productivities and their disutilities from secondary-sector employment<sup>23</sup> are assumed to depend on their past employment histories. These models differ from the Harris-Todaro model, which rests on another heterogeneity, namely, differences between unemployed and secondary-sector workers in terms of their probabilities ( $\rho$ ) of finding primary-sector employment.

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<sup>22</sup>Our qualitative conclusions would remain unchanged if we also allow workers to differ in terms of their costs of search in the primary sector (which, for simplicity, have been ignored in the analysis above), their rates of time discount ( $\delta$ ), their survival probabilities ( $\theta$ ), and the functional forms of their utility functions.

<sup>23</sup>Nothing of substance would be added to our analysis by allowing for the possibility that workers' previous job experience affects their disutilities from being unemployed.

#### 4. Three Models of Unemployment and Labor Market Segmentation

On this basis, we construct three models of segmented labor markets and examine how these markets respond to external shocks.

##### *4a. Exogenous Heterogeneities*

In the first model, workers' heterogeneities of preferences, productivities, and endowments are assumed to be exogenously given. Intuitively, it is easy to see how these heterogeneities can be responsible for the coexistence of unemployment and secondary-sector employment. To begin with, suppose that workers are alike in all respects except their disutilities from working in the secondary sector. Then the unemployed will be those who find work in the secondary sector particularly onerous; the rest of the unprivileged workers join the secondary sector.<sup>24</sup>

Now suppose, instead, that workers differ only in terms of their productivities in the secondary sector. Then the unemployed workers turn out to be those whose secondary-sector productivity is comparatively low, while the rest join the secondary sector.

Finally, suppose that workers differ only in terms of their endowments. Assuming them to have declining marginal utility of consumption, those workers with comparatively large endowments have comparatively little to gain from employment in the secondary sector: their marginal utility of consumption from their secondary-sector wage income is comparatively low. Thus these workers will choose to remain unemployed, while the rest join the secondary sector.

We assume that the utility differentials  $V_s[i] - V_u[i]$  for all workers  $i=1, \dots, I$  can be ordered along a continuum, from highest to lowest:

$$(17) \quad \Phi = \Phi(N), \quad \Phi' < 0,$$

where  $N$  is the aggregate employment level (covering both primary and

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<sup>24</sup> Obviously, analogous arguments can be made in terms of worker heterogeneity by disutility from unemployment or by utility from consumption.

secondary sectors).<sup>25</sup> Furthermore, let the workers currently employed in the primary sector be chosen randomly along this continuum, so that the unprivileged workers' utility differentials can also be approximated by this continuum.

In an "interior" equilibrium, where an unemployment pool exists alongside a secondary sector, the marginal employee in the secondary sector is indifferent between unemployment and secondary-sector employment.<sup>26</sup>

$$(19) \Phi(N^*) = 0.$$

This condition yields the equilibrium level of aggregate employment,

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<sup>25</sup>Special cases of the  $\Phi$  function are easy to derive. For example, assume that workers' utility functions are additively separable, that workers differ only in terms of their disutilities from working in the secondary sector, and that these disutilities can be ordered along a continuum, from lowest to highest:  $e_s = e_s(N)$ ,  $e' > 0$ . Then the present value of a secondary-sector worker's utility is

$$V_s = \Gamma(a_s + x) - e_s(N) + \delta \cdot \theta \cdot \{\rho \cdot [\Gamma(w_p + x) - e_p] + (1-\rho) \cdot [\Gamma(a_s + x) - e_s(N)]\}$$

and the present value of an unemployed worker's utility is

$$V_u = \Gamma(b + x) - e_u + \delta \cdot \theta \cdot \{\rho \cdot [\Gamma(w_p + x) - e_p] + (1-\rho) \cdot [\Gamma(b + x) - e_u]\}.$$

Then the  $\Phi$  function is

$$\Phi = \Gamma(a_s + x) - e_s(N^*) - [\Gamma(b + x) - e_u].$$

<sup>27</sup>This equilibrium is stable. If  $V_s[i] - V_u[i] < 0$  for the marginal employee  $i$  in the secondary sector, then that worker will join the unemployment pool. As result, the return from secondary-sector employment rises.

<sup>27</sup>This equilibrium is stable. If  $V_s[i] - V_u[i] < 0$  for the marginal employee  $i$  in the secondary sector, then that worker will join the unemployment pool. As result, the return from secondary-sector employment rises.

$N^*$ ,<sup>28</sup> 29 which is illustrated in Figure 2 by the point at which the  $\Phi(N)$  curve crosses the horizontal axis.

As shown in Section 2, the equilibrium level of primary-sector employment ( $N_p^*$ ) is given by the intersection between the primary-sector employment function ( $E_p$ ) and the wage setting function ( $WS_p$ ) in Figure 2. The equilibrium level of secondary-sector employment ( $N_s^*$ ) is the residual between aggregate employment ( $N^*$ , determined by condition (19)) and primary-sector employment ( $N_p^*$ ):

$$(20) \quad N_s^* = N^* - N_p^*.$$

The equilibrium level of unemployment is the difference between the aggregate labor force ( $\bar{N}$ ) and aggregate employment ( $N^*$ ):

$$(21) \quad U^* = \bar{N} - N^*.$$

Given the equilibrium levels of primary-sector employment and unemployment, the probability ( $\rho$ ) of finding primary-sector employment may be determined as  $\rho = (\theta \cdot N_p^*) / (\theta \cdot N_p^* + U^*)$ , i.e. the ratio of vacancies to job searchers.

It is easy to see where the major difference between this model and the Harris-Todaro model lies. Since workers must be unemployed to find primary-sector jobs in the Harris-Todaro model, the returns to unemployment (relative to the returns from secondary-sector employment) depend positively on the expected income from primary-sector employment, and thus the equilibrium level of unemployment is also positively related to expected primary-sector labor income. By contrast, our model of exogenous heterogeneity

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<sup>28</sup>This equilibrium is stable. If  $V_s[i] - V_u[i] < 0$  for the marginal employee  $i$  in the secondary sector, then that worker will join the unemployment pool. As result, the return from secondary-sector employment rises.

<sup>29</sup>Since we are concerned with explaining the presence of unemployment in the context of a segmented labor market, we do not consider corner-point equilibria, in which either unemployment or secondary-sector employment is zero.

displays a dichotomy between primary-sector employment and unemployment. A labor market change that raises primary-sector employment<sup>30</sup> leaves the aggregate levels of employment ( $N^*$ ) and unemployment ( $U^*$ ) unchanged. The reason is that aggregate employment ( $N^*$ ) is determined by the relative return from secondary-sector employment and from unemployment; it does not depend on primary sector at all.<sup>31</sup> Moreover, since aggregate employment remains unchanged and the labor force is constant, the equilibrium level of unemployment ( $U^*$ ) also remains unchanged and secondary-sector employment must fall. In short, whereas the Harris-Todaro model implies that an expansion of the primary sector (accompanied by an increase in expected labor income from that sector) creates more unemployment, the model above implies that the unemployment is independent of the primary sector's fortunes.

#### *4b. Endogenous Tastes*

The next model describes how unemployment can arise on account of the way in which labor market segmentation affects workers' tastes. Specifically, it rests on the hypothesis that employment in the primary sector gives workers a sense of status and pride that makes them consider secondary-sector work more disagreeable than they would otherwise have done - in particular, more onerous relative to remaining unemployed. Thus, workers who have left the primary sector have a greater incentive to join the unemployment pool than those who have not held primary-sector jobs. As the analysis below will show, a labor market which runs along these lines responds quite differently

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<sup>30</sup>For example, such a change could take the form of a rise in insider productivity that shifts the primary-sector employment curve  $E_p$  upwards, or a policy that reduces insider market power so as to shift the wage setting curve  $WS_p$  downward.

<sup>31</sup>In terms of Figure 2, a rise in primary-sector employment does not shift the utility differential function  $\Phi$ . The reason is that the new entrants to the primary sector are chosen randomly from the unprivileged workers and thus the ranking of utility differentials among the unprivileged workers remains unchanged.

to productivity shocks and policy changes than the segmented labor markets considered above.

To formalize this rationale for unemployment, we extend our analysis to include primary-sector firing activity, thereby generating a group of "unprivileged" workers with "privileged" tastes. Suppose that a constant proportion  $\lambda$  ( $0 < \lambda < 1$ ) of all primary-sector firms goes out of business and an equal proportion of new firms enters the primary sector in each period.<sup>32</sup> Consequently,  $\lambda \cdot N_p^*$  employees in the primary sector lose their jobs per period. It is these workers who view secondary-sector employment as more onerous than the rest of the workers. To bring this feature into sharp focus, let all workers be alike except in this regard.

The workers who have just lost their jobs in the primary sector will be called the "p-workers", while the other workers will be referred to as the "np-workers" (where "p" stands for "primary sector" and "np" stands for "not p-workers"). For each of p-workers, let the disutility from working in the secondary sector be  $e_s[p]$ . By equations (15) and (16), it is clear that the difference between the discounted return from secondary-sector employment ( $V_s[p]$ ) and that from unemployment ( $V_u[p]$ ) for these workers is

$$(22a) \quad V_s[p] - V_u[p] = \{(\Gamma(a_s + x, e_s[p]) - (\Gamma(b + x, e_u))) \cdot (1 + \delta \cdot \theta \cdot (1 - \rho))\}$$

Furthermore, let the disutility from secondary-sector work for all other workers be  $e_s[np]$ . For these workers the return differential between secondary-sector employment and unemployment is

$$(22b) \quad V_s[np] - V_u[np] = \{(\Gamma(a_s + x, e_s[np]) - (\Gamma(b + x, e_u))) \cdot (1 + \delta \cdot \theta \cdot (1 - \rho))\}$$

The focal assumption of this model is that  $e_s[p] > e_s[np]$ . Thus the return differential between secondary-sector employment and

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<sup>32</sup>To aid intuition, imagine that all firms currently in the primary sector as well as all firms which are potential entrants to that sector face random, iid fixed costs of production, so that some firms become unprofitable whereas others become profitable.



unemployment must always be smaller for the p-workers than for the np-workers:  $V_s[p] - V_u[p] < V_s[np] - V_u[np]$ . Since this paper is concerned with the presence of unemployment under segmented labor markets, we focus our attention on the case in which the p-workers prefer unemployment to secondary-sector employment while the np-workers have the opposite preference,<sup>33</sup> so that unemployment and secondary-sector employment coexist:

$$(23) \quad V_s[p] - V_u[p] < 0 \text{ and } V_s[np] - V_u[np] > 0.$$

As in the models above, we continue to assume that all the unprivileged workers (whether in the secondary sector or the unemployment pool) have an equal chance ( $\rho$ ) of finding a job in the primary sector. Thus, of the  $\lambda \cdot N_p^*$  employees who lose their primary-sector jobs, on average  $\rho \cdot \lambda \cdot N_p^*$  of them are rehired into the primary sector. By condition (23), the rest of the p-workers join the unemployment pool. Thus the equilibrium level of unemployment is

$$(24) \quad U^* = (1-\rho) \cdot \lambda \cdot N_p^*.$$

The employment probability  $\rho$  is the ratio of the number of vacancies in the primary sector ( $\lambda \cdot N_p^*$  in new firms plus  $(1-\theta) \cdot (1-\lambda) \cdot N_p^*$  in old firms, yielding a total of  $[1-\theta \cdot (1-\lambda)] \cdot N_p^*$  vacancies) to the number of job searchers ( $N_s^* + U^* = \bar{N} - N_p^*$ ):

$$(25) \quad \rho^* = \left[ \frac{N_p^*}{\bar{N} - N_p^*} \right] \cdot [1 - \theta \cdot (1-\lambda)].$$

Substituting equation (25) into (24), we find that a rise in primary-sector employment (due to a downward shift of the  $WS_p$  curve or

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<sup>33</sup>There are two other substantive cases. In one, both types of workers prefer the secondary sector:  $V_s[p] - V_u[p], V_s[np] - V_u[np] > 0$ , and thus there is no unemployment in equilibrium. In the other, both types of workers prefer being unemployed:  $V_s[p] - V_u[p], V_s[np] - V_u[np] < 0$ , and thus there is no secondary-sector employment in equilibrium.

an upward shift of the  $E_p$  curve) has two countervailing effects on unemployment: [i] an "unemployment creation effect"  $((1-\rho) \cdot \lambda \cdot dN_p^*)$  which increases the number of p-workers  $(\lambda \cdot N_p^*)$ , and [ii] an "employment creation effect"  $([1-(d\rho/dN_p^*) \cdot (dN_p^*)] \cdot \lambda \cdot N_p^*)$  which raises the proportion of p-workers returning to the primary sector. It is easy to see that the effect of primary-sector employment on unemployment depends on the relative values of the turnover parameter  $\lambda$ , the retirement rate  $\theta$ , the aggregate labor force  $\bar{N}$ , and the level of primary-sector employment  $N_p^*$ . The lower  $\lambda$ , the greater  $\theta$ , and the lower  $\bar{N}$ , the greater is  $(dU^*/dN_p^*)$ .<sup>34</sup> In Figure 3 we depict the case in which the employment creation effect dominates the unemployment creation effect, so that a rise in primary-sector employment is associated with a fall in unemployment. Thus the  $U^* = (1-\rho) \cdot \lambda \cdot N_p^*$  curve is downward-sloping.

As in the previous model, the equilibrium level of primary-sector employment ( $N_p^*$ ) is determined by the intersection of the  $E_p$  function and the  $WS_p$  function. Given  $N_p^*$ , conditions (24) and (25) determine the equilibrium level of unemployment ( $U^*$ ). The equilibrium level of secondary-sector employment is the residual:  $N_s^* = \bar{N} - N_p^* - U^*$ .

The behavior and policy implications of this model depend crucially on the relative magnitudes of the employment creation and unemployment creation effects. Unless these two effects are of equal magnitude, there is no dichotomy between primary-sector employment and unemployment. In the Harris-Todaro model, as noted, the level of unemployment rises in response to an increase in the level of expected primary-sector labor income (regardless of whether the increase is due to more employment or higher wages in the primary sector). In this model, by contrast, the unemployment level depends on the level of primary-sector employment, not on expected primary-sector labor income. Since unemployed and secondary-sector workers have equal chance of finding primary-sector jobs in our model, a rise in expected primary-sector labor income does not raise the returns from unemployment relative to those from secondary-sector employment.

Suppose that primary-sector employment ( $N_p^*$ ) rises while the

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<sup>34</sup>By equations (24) and (25) it can be shown that

$$\frac{dU}{dN_p^*} \gtrless 0 \Leftrightarrow [1 - \theta \cdot (1-\lambda)] \cdot [2\bar{N} - 3N_p^*] \gtrless (\bar{N} - N_p^*)/N_p^*.$$

primary-sector real wage ( $w_p^*$ ) remains constant (say, due to equal outward shifts of the  $E_p$  and  $WS_p$  curves). Then, if the employment creation effect dominates the unemployment creation effect, our model yields precisely the opposite predictions of the Harris-Todaro model: the rise in primary-sector employment reduces (rather than raises) unemployment. Applying this analysis to developing countries, urban development does in this case ameliorate the unemployment problem.<sup>35</sup>

The two models also have different implications regarding the response of unemployment to productivity changes in the secondary sector. In the Harris-Todaro model, an increase in secondary-sector productivity (*ceteris paribus*) reduces unemployment (since it raises the returns from secondary-sector employment relative to the returns from unemployment). In our model, such a productivity increase leaves unemployment unchanged. Although this stark result is an artifact of our extreme assumption that only the workers who leave the primary sector have an incentive to join the unemployment pool, it does suggest that insofar as primary-sector employment has a pronounced effect on workers' attitudes to secondary-sector employment in practice, improvements in secondary-sector productivity may have little influence on unemployment. For developing countries, in this case, rural development is not very effective in dealing with unemployment.

#### 4c. *Endogenous Productivities*

Our final model examines how unemployment in segmented labor markets depends on human capital acquisition in the secondary sector.<sup>36</sup> This model is not so much about why workers choose to enter the

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<sup>35</sup>Needless to say, if the unemployment creation effect dominates the employment creation effect, the predictions of our model and the Harris-Todaro model are qualitatively similar.

<sup>36</sup>The inclusion of human capital acquisition in the primary sector requires no formal change of our model, merely a reinterpretation: the wedge between the upper and lower portions of the  $E_p$  curve may be due not only to labor turnover costs, but to a human capital differential between insiders and outsiders.

secondary sector, but why they choose to stay there. We assume that the productivities of workers in the secondary sector depend on their length of job tenure there, say, on account of learning by doing. This means that workers who were previously employed in the secondary sector have a comparatively high productivity in that sector and thus a comparatively strong incentive to remain there, while other workers have a comparatively strong incentive to join the unemployment pool (*ceteris paribus*).

We divide the unprivileged workers (i.e. those not in the primary sector) into two groups: [i] those who were employed in the secondary sector in the previous period, whom we call the "s-workers", and [ii] all the rest, whom we call the "ns-workers" (where "ns" stands for "not s-workers"). For simplicity, we assume that all s-workers have the same productivity,  $a_s[s]$ , and all the ns-workers have the same productivity,  $a_s[ns]$ . The focal assumption of this model is that  $a_s[s] > a_s[ns]$ .

If we introduce this assumption into our model of exogenous heterogeneities (Section 4a), the function representing workers' utility differentials,  $V_s[i] - V_u[i]$ , becomes kinked:

$$\begin{aligned} (26) \quad \tilde{\Phi} &= \Phi^+(N) & \text{for } N < N_p + M_s, \\ \tilde{\Phi} &= \Phi^-(N) & \text{for } N > N_p + M_s, \end{aligned}$$

$(\tilde{\Phi})', (\tilde{\Phi})' < 0$ , and  $\tilde{\Phi}_1(N) > \tilde{\Phi}_2(N)$ , and  $M_s$  is the number of s-workers. This is illustrated in Figure 4, where the top segment of the  $\tilde{\Phi}$  curve portrays the utility differentials of the s-workers and the bottom segment gives the utility differentials of the potential entrants to the secondary sector. Furthermore, let  $(1-\theta)$  be the rate of retirement from and entry to the labor force, so that the primary sector has  $(1-\theta) \cdot N_p^*$  vacancies per period.<sup>37</sup> Given that these vacancies are filled randomly from the available applicants, the unprivileged workers' utility differentials may also be approximated by the function (26).

In equilibrium, the marginal unprivileged worker is indifferent

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<sup>37</sup>For the purposes of this model, it is not necessary to retain the assumption of Section 4b that some firms go out of business and others enter in each period.

between unemployment and employment in the secondary sector. Thus

$$(27) \quad \tilde{\Phi}(N^*) = 0,$$

which determines the equilibrium level of aggregate employment,  $N^*$ .

The secondary sector may be in one of three scenarios: [i] a "retention scenario" (the case illustrated in Figure 4) where the kink in the  $\tilde{\Phi}$  function intersects the horizontal axis, so that all incumbents in the secondary sector are retained, but no new entrants are hired, [ii] a "hiring scenario" (not shown in the figure) where the bottom segment of the  $\tilde{\Phi}$  function intersects the horizontal axis, so that some new entrants are hired and all incumbents are retained, and [iii] a "firing scenario" (also not shown in the figure) where the intersection occurs on the top segment of the  $\tilde{\Phi}$  function, so that some incumbents in the secondary sector are fired and no new entrants are hired.

The number of entrants to the secondary sector ( $N_{se}$ ), if positive, is the difference between aggregate secondary-sector employment ( $N^* - N_p^*$ ) and the number of s-workers ( $M_s$ ):

$$(28) \quad N_{se} = \max [(N^* - N_p^* - M_s), 0],$$

where  $N^*$  is given by equation (27), and  $N_p^*$  is determined by the intersection between the  $E_p$  and  $WS_p$  curves. The long-run equilibrium number of s-workers is given by the condition that the number of secondary-sector entrants be equal to the number of retiring s-workers:

$$(29) \quad N_{se} = (1 - \theta) \cdot M_s.$$

The policy implications of this model differ in important ways from those of the Harris-Todaro model and the models above. Specifically, this model implies that "small" changes in primary-sector employment may have a quite different qualitative influence on unemployment than "large" changes do. Suppose, for instance, that the secondary sector is initially in the retention scenario and that there is then an increase in primary-sector employment (say, on account of a rise in primary-sector productivity, as illustrated by the dashed  $E_p$  curve in Figure 4). Let this increase be "small" in the sense that the secondary sector remains in the

retention scenario after the primary-sector shock (as shown by the dashed  $\Phi$  curve in the figure). Then there is no dichotomy between primary-sector employment and unemployment: the rise in primary-sector employment leads to an equal fall in unemployment. This behavior contrasts with the Harris-Todaro model, where an increase in primary-sector employment raises unemployment.

However, a "large" increase in primary-sector employment - one that moves the  $\Phi$  function far enough to the right to shift the secondary-sector from the retention scenario to the firing scenario - will have quite different implications for unemployment. The reason is that once the secondary sector leaves the retention scenario, the model become analytically identical to our model of exogenous heterogeneities. In this latter model, it will be recalled, there is a dichotomy between primary-sector employment and unemployment. Thus, whereas the "small" increase in primary-sector employment (described above) reduced the level of unemployment, a "large" increase in primary-sector employment will do nothing to reduce it further.<sup>38</sup>

In short, the responsiveness of unemployment to a primary-sector employment shock depends on the relation between (a) the degree of human capital accumulation in the secondary sector and (b) the magnitude of the primary-sector shock. The larger is the former factor, the greater is the range of primary-sector shocks to which unemployment responds.

## 5. Concluding Remarks

This paper has considered some misgivings about the Harris-Todaro theory as an explanation of unemployment in segmented labor markets, and has sought some alternatives to it. The explanations we propose

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<sup>38</sup>Of course, had we combined our model of endogenous productivities with the model of endogenous tastes (instead of with the model of exogenous heterogeneities), a "large" increase in primary-sector employment will either amplify or counteract the effect of a "small" increase in primary-sector employment, depending on whether the employment creation effect dominates the unemployment creation effect or vice versa.

are all complementary. In practice, we expect them all to be in operation simultaneously. Nevertheless, their divergent policy implications make it useful to analyze them separately.

Our explanations have quite different policy implications to the Harris-Todaro theory. In particular, an expansion of the primary sector in our models does not necessarily lead to a rise in the unemployment pool, and may in fact reduce it. Our analysis suggests that this effect depends crucially on what is responsible for workers' choices between unemployment and secondary-sector employment: whether it is exogenous heterogeneities, endogenous tastes, or endogenous productivities.

We have shown that under exogenous heterogeneities there is a dichotomy between primary-sector employment and unemployment, whereas under endogenous tastes and productivities such a dichotomy is generally not present. We have seen that the influence of endogenous productivities is to generate an inverse relation between primary-sector employment and unemployment when the secondary sector is in the retention scenario. Furthermore, the influence of endogenous tastes depends on the relative strength of what we have called the employment- and unemployment-creation effects.

In practice, of course, there are supply- and demand-side linkages between the primary and secondary sectors that may tend to make primary-sector employment move inversely relative to unemployment. Specifically, in the presence of complementarities in production between the primary and secondary sectors, a rise in primary-sector employment will raise productivity in the secondary sector, and thereby reduce workers' incentives to join the ranks of the unemployed. Furthermore, a rise in primary-sector employment may lead to a rise in income that stimulates the demand for secondary-sector products, thereby raising the marginal revenue products of secondary-sector workers and once again leading to a reduction in the level of unemployment. For brevity, these supply- and demand-side linkages have not been included in the analysis above, although inspection shows that it would be easy to do so. In this context of our models, these linkages make it more likely that primary-sector employment and unemployment become inversely related, as we seem to observe in practice.

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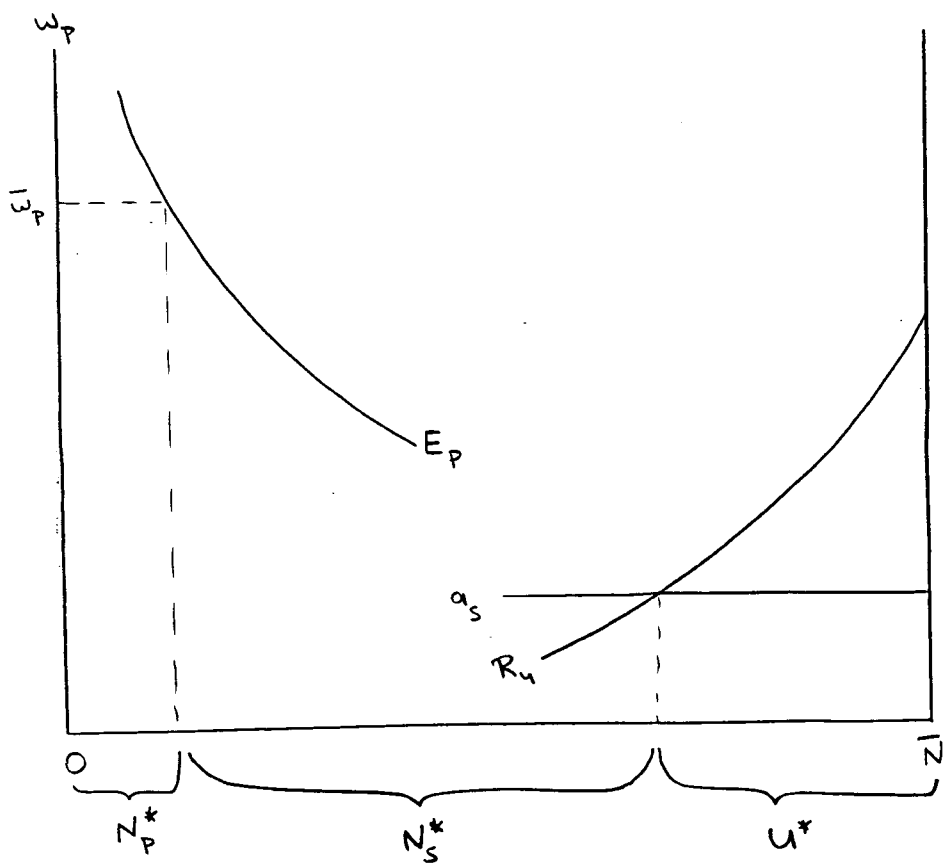


FIGURE 1: Unemployment in the Harris-Todaro Model

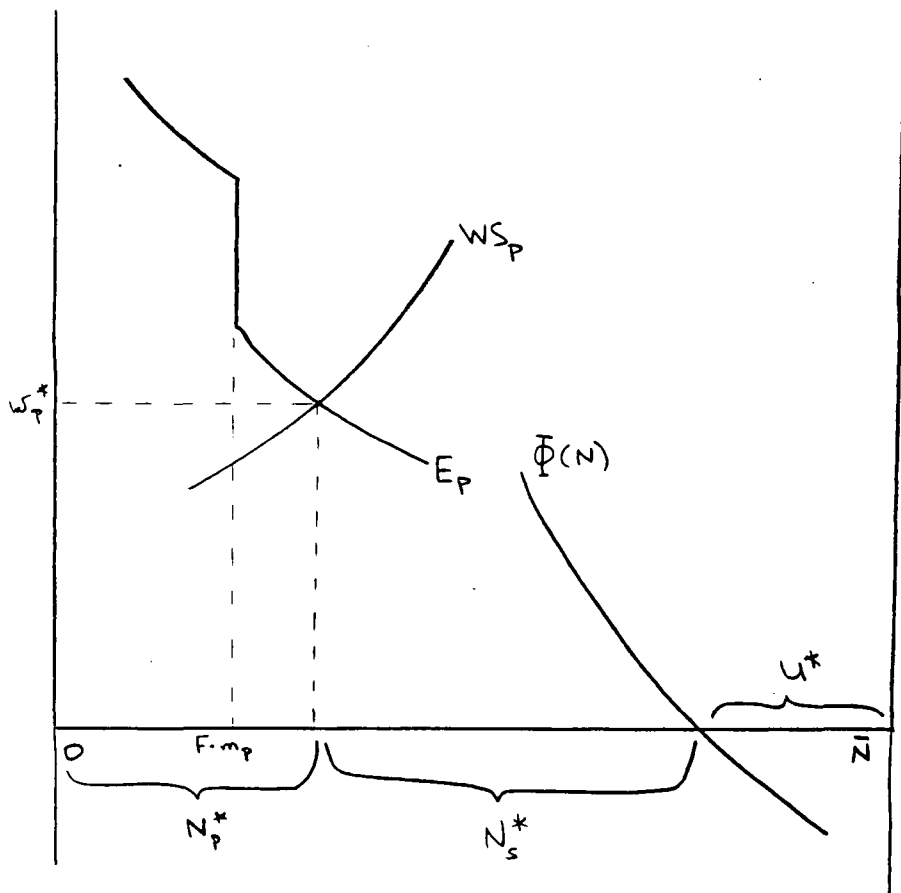


FIGURE 2: The Labor Market under Exogenous Heterogeneities

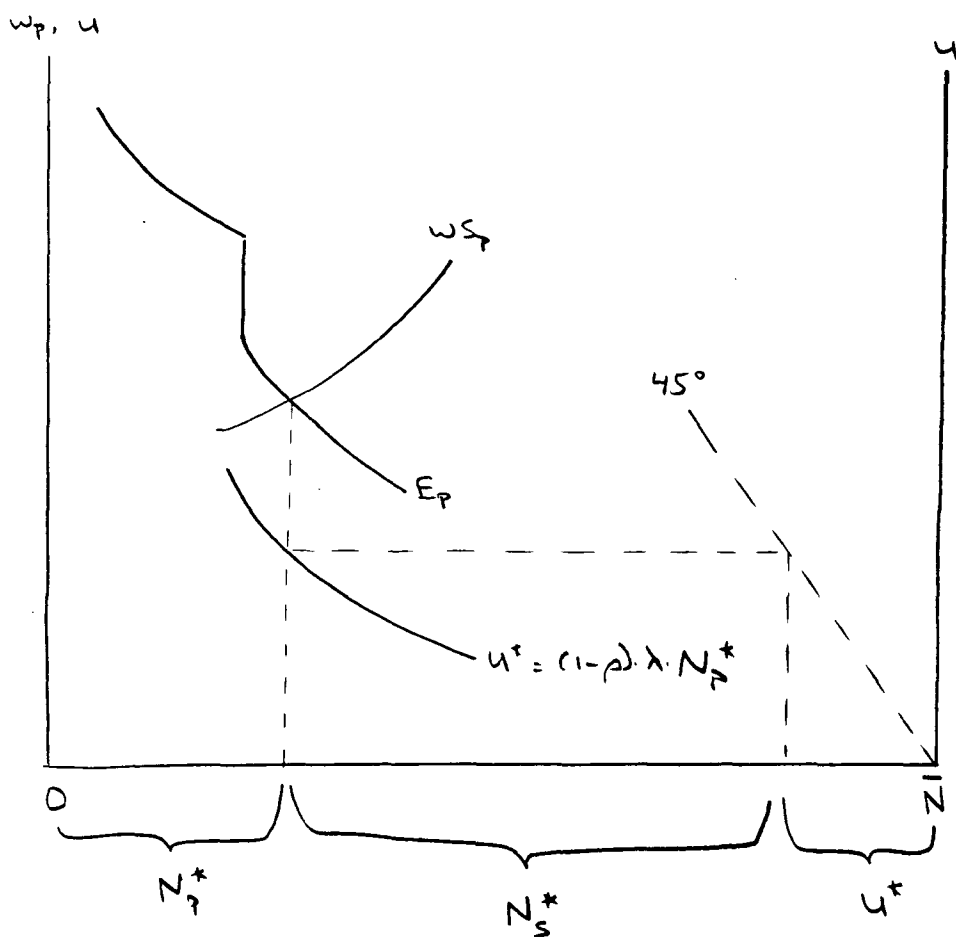


FIGURE 3: The Labor Market under Endogenous Tastes

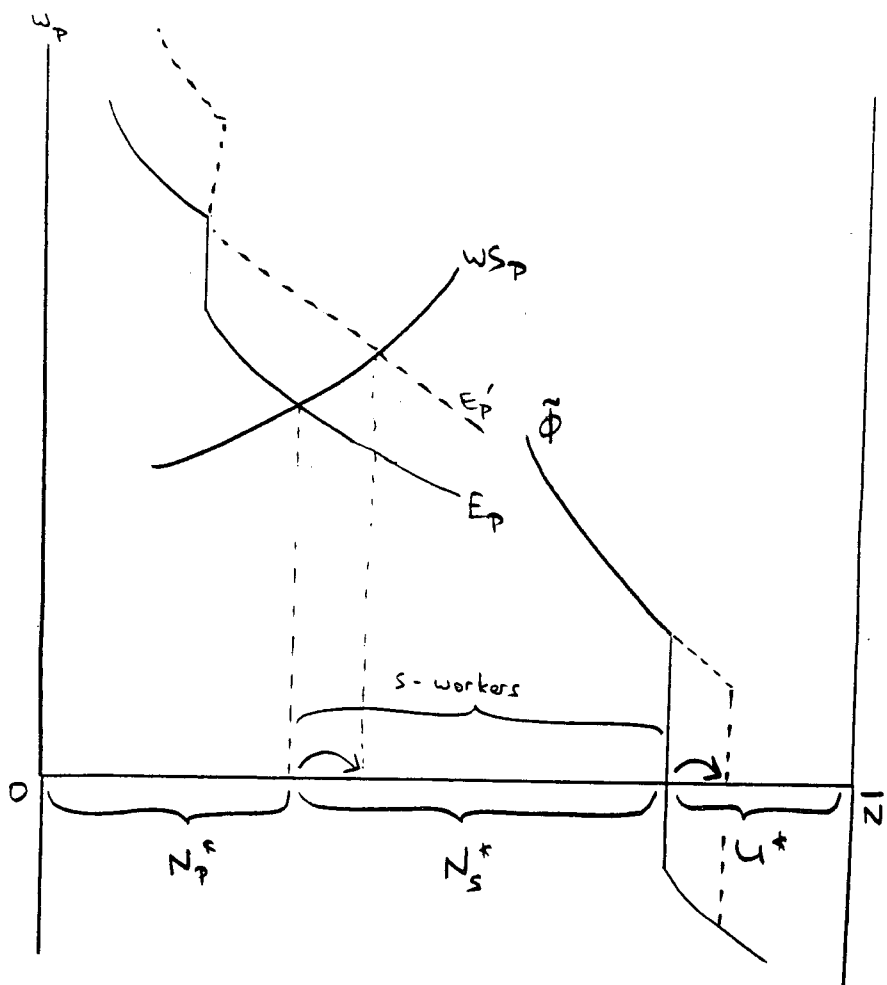


FIGURE 4: The Labor Market under Endogenous Productivities