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Abstract

This paper examines the two-sector general equilibrium model under a variety of labor-market distortions, including minimum wages (both sector-specific and economy-wide) and factor-price differentials (both absolute and proportional). We introduce a new concept—the "wage sensitivity" ranking between sectors—and show that a necessary and sufficient condition for temporal convergence locally is that the physically labor-intensive sector be the wage-sensitive sector. The new concept has global significance as well; it signals the direction of capital movements whereas the physical sector-intensity ranking determines their consequences.

1. Introduction

Attempts by governments and private groups to influence the distribution of income often introduce distortions into factor markets. In appraising these attempts a distinction must be drawn between the immediate short-term consequences of such policies and longer-term effects which incorporate the induced relocation of productive factors. These factor reallocations over time may serve dramatically to frustrate the intended objectives of such policies.

This contrast between the short-run and long-run effects of labor market interventions has been noted in a number of different models. The transition from short to long-run equilibrium has been studied in the context of wage policies following a devaluation by Jones and Corden (1976); of proportional factor-price differentials by Neary (1978); and of the Harris-Todaro model of unemployment in developing countries by Neary (1981). Without explicitly considering the adjustment process, the possibility that a diversified long-run equilibrium may not exist or may not be approached has been noted in the minimum-wage context, whether economy-wide as in Brecher (1974) or sector-specific as in McCulloch (1974) and Carruth and Oswald (1982). However, the general principles which underlie these different results have so far defied elucidation.

In this paper we introduce a new concept - the "wage sensitivity ranking" of two sectors - which serves to synthesise these and other existing results

and to suggest many new ones. We define a sector as "wage sensitive" if the short-run return to capital there is more vulnerable to a tightening of labor-market pressures than that in the other sector. In the absence of labor-market distortions, the wage-sensitive sector is necessarily the labor-intensive one. A major finding of our paper is that problems of convergence to long-run equilibrium are likely to arise when the rankings of sectors by these two criteria diverge.

Section 2 introduces the model and develops the key result for local stability of equilibrium. The subsequent three sections then examine the global as well as local responses of the economy to the introduction of three alternative labor-market distortions: sector-specific or economy-wide minimum wages in a completely open economy and sector-specific real wage ceilings in a dependent economy producing non-traded as well as traded goods. In all cases we demonstrate that the wage-sensitivity ranking of the sectors reveals the incentives for medium-run capital reallocation generated by the distortion in question. By contrast, it is the physical factor-intensity ranking which determines the implications of such reallocation. Finally, Section 6 summarises our results and draws some general lessons for the efficacy of labor-market interventions.

2. Local Stability of the Capital Reallocation Process

In the present section we describe the process of adjustment when a disturbance to factor markets from an initial long-run equilibrium position causes returns to sector-specific capitals to differ, thus providing a signal for a subsequent reallocation of capital (and labor) between sectors. Such a

reallocation itself puts pressure on factor prices to change and the question raised is whether these subsequent alterations serve to restore factor prices to their initial long-run values. If so, the capital reallocation process is locally stable.

The setting is general in the specification of the wage relationships in the two sectors as a consequence of labor market distortions and/or policies built in to guide wage behavior. Think of a free wage rate, \underline{w} , typically associated with the wage rate in at least one sector of the economy, which is sensitive to pressures in the labor market. Then let the wage rate in each sector be linked to this wage rate:

$$(2.1) \quad w_1 = f^1(w) \quad \text{and} \quad w_2 = f^2(w).$$

If pressures in the labor market cause the free wage, \underline{w} , to change, this change is transmitted to each sector in a manner which is captured in elasticity form by:

$$(2.2) \quad \hat{w}_1 = \alpha_1 \hat{w} \quad \text{and} \quad \hat{w}_2 = \alpha_2 \hat{w}.$$

where a "hat" over a variable indicates relative changes ($\hat{x} = dx/x$). Major cases of labor-market distortions that have been considered in the literature can be related to these elasticities. Thus a sector-specific minimum wage in sector j implies $\alpha_j = 0$, with the α in the free sector set equal to unity. A constant proportional wage differential, extensively treated in the literature, can be captured by setting each α_j equal to unity. (This, of course, does not imply that wages are equal in the two sectors, only that

their proportional gap is kept constant.) A constant absolute wage differential would imply that α_1 equals $1/w_1$ and α_2 equals $1/w_2$. We return to these cases later.

The competitive profit equations of change when capital is temporarily tied to each sector, thus allowing rental rates r_1 and r_2 to differ, are shown in equations (2.3):

$$(2.3) \quad \begin{aligned} \theta_{L1} \hat{w}_1 + \theta_{K1} \hat{r}_1 &= \hat{p}_1 \\ \theta_{L2} \hat{w}_2 + \theta_{K2} \hat{r}_2 &= \hat{p}_2. \end{aligned}$$

The θ_{ij} refer to factor i 's distributive share in the j^{th} sector. To analyze the local stability of the capital reallocation process we assume that initially rates of return to capital are equal and that throughout the process commodity prices are kept constant. Making use of the link between wage rates in each sector described in (2.2), the competitive profit equations of change can be rewritten as in (2.4):

$$(2.4) \quad \begin{aligned} \tilde{\theta}_{L1} \hat{w} + \tilde{\theta}_{K1} \hat{r}_1 &= 0 \\ \tilde{\theta}_{L2} \hat{w} + \tilde{\theta}_{K2} \hat{r}_2 &= 0 \end{aligned}$$

where $\tilde{\theta}_{Lj}$ is defined as $\alpha_j \theta_{Lj}$ divided by $(\alpha_j \theta_{Lj} + \theta_{Kj})$ and $\tilde{\theta}_{Kj}$ is θ_{Kj} deflated by this same term. (These deflations allow the sum of the $\tilde{\theta}$'s in each sector to add to unity). Such a revision of the competitive profit conditions shows how, at given commodity prices, an increase in the free-market level of wages is transmitted into a fall in returns to capital in each sector. This restatement encourages a new concept - that of wage sensitivity:

Definition: Sector j is relatively wage sensitive if and only if at constant commodity prices upward pressure on wages in the labor market squeezes rentals relatively more in sector j than in the other sector.

Given this definition of wage sensitivity, sector 1 is clearly the wage-sensitive sector for a small increase in the wage if the "distributive share" for the free wage in that sector, $\tilde{\theta}_{L1}$, exceeds that in sector 2, $\tilde{\theta}_{L2}$. This may be expressed in terms of the determinant of coefficients in equations (2.4), $|\tilde{\theta}|$; the fact that the sum of the $\tilde{\theta}$'s in each industry is unity implies that $\tilde{\theta}_{L1}$ exceeds $\tilde{\theta}_{L2}$ if and only if $|\tilde{\theta}|$ is positive. Straightforward calculations of this determinant reveal that sector 1 is the wage-sensitive sector if and only if

$$(2.5) \quad \alpha_1 w_1 l_1 > \alpha_2 w_2 l_2,$$

where l_j indicates the physical labor-capital ratio employed in sector j . In completely undistorted markets this reduces to a comparison of physical labor-capital ratios. The case of proportional wage distortions, with the α 's unity, allows sector 1 to be the wage-sensitive sector even if sector 2 is physically labor-intensive. This requires, of course, that labor receives a wage premium in the first sector. In such a case we refer to a reversal of the factor-intensity ranking between the physical and value versions of factor proportions. Sector 1 is labor-intensive in a value sense if $|\theta|$, the determinant of distributive factor shares, is positive (or if $w_1 l_1$ exceeds $w_2 l_2$), while sector 2 is labor-intensive in a physical sense if l_2 exceeds l_1 .

The concept of wage sensitivity applies as well to cases in which distortions and/or policies in labor markets dictate that wage rates intersectorally do not even maintain a proportional relationship to each

other. For example, even if sector 1 is physically labor-intensive, and even if labor employed in that sector receives a premium, sector 2 is the wage-sensitive sector if sector 1 is bound by minimum wage regulations. Upward pressure on labor markets would not disturb the return to capital in sector 1, but would depress it in wage-sensitive sector 2.

To pursue the question of local stability or convergence of the capital reallocation process, suppose the free wage rate is dislodged by a small downward movement relative to its long-run equilibrium value. In the short run, before capital can reallocate between sectors, returns to capital are driven up in each sector, but more so in the wage-sensitive sector. Assume $|\tilde{\theta}| > 0$, so that this is sector 1 and thus $r_1 > r_2$. With factor prices temporarily frozen at these new levels, examine the pressures on factor markets once capital begins to relocate, with the rental discrepancies ensuring that $\hat{K}_1 > \hat{K}_2$.

Two relationships bind the changes in capital employed in each sector. On the one hand we assume no new capital is created and that the capital leaving one sector is employed in the other. This implies:

$$(2.6) \quad \lambda_{K1} \hat{K}_1 + \lambda_{K2} \hat{K}_2 = 0,$$

with λ_{ij} denoting the fraction of the economy's supply of factor i employed in sector j . On the other hand consider the overall demand for labor, made up of the demand in each industry. With factor prices temporarily frozen, the relative change in each sector's demand for labor is tied one-for-one to its demand for capital, i.e., $\hat{L}_j = \hat{K}_j$. It follows that

$$(2.7) \quad \lambda_{L1} \hat{K}_1 + \lambda_{L2} \hat{K}_2 = \hat{L}^D,$$

where L^D indicates the economy's total demand for labor. Subtracting (2.6) from (2.7),

$$(2.8) \quad \hat{L}^D = |\lambda| (\hat{K}_1 - \hat{K}_2),$$

where $|\lambda|$ equals $\lambda_{L1} - \lambda_{L2}$ and is positive if and only if sector 1 is the physically labor-intensive sector. If so, the flow of capital towards physically labor-intensive sector 1 must put upward pressure on wages in the labor market. The capital reallocation process would, in this case, tend to restore the wage rate to its long-run equilibrium value and, as well, restore the equality in returns to capital. Thus we have proved:

Theorem: The capital reallocation process is locally stable if and only if the physically labor-intensive sector is the wage-sensitive sector. That is, stability requires that $|\lambda| |\tilde{\theta}|$ be positive.

The wage-sensitivity ranking indicated by $|\tilde{\theta}|$ shows which rental is driven up relatively more when the free wage falls. This provides the signal for the direction of capital (and labor) reallocation. The physical factor intensity ranking, indicated by the sign of $|\lambda|$, reveals the consequence of such a reallocation for aggregate labor demand and thus the direction of

subsequent changes in wage rates and rentals. Stability requires $|\tilde{\theta}|$ and $|\lambda|$ to have the same sign.¹

To see the usefulness of this result, consider its implications for three particular forms of labor-market distortion:

(i) Proportional Wage Differentials: This form of distortion, which implies that α_1 and α_2 are both unity, has been extensively studied in writings on tax incidence, stemming from Harberger (1962), on the effects of unionization by Johnson and Mieszkowski (1970) and on international trade issues (see for example, Jones (1971a) and Magee (1976)). In this special case the ranking of sectors by wage sensitivity reduces to the value factor intensity ranking provided by $|\theta|$, the determinants of the coefficient matrix in (2.3). Hence we have the result of Neary (1978) that a necessary and sufficient condition for local stability of an equilibrium is that the determinants $|\lambda|$ and $|\theta|$ have the same sign; in other words, that the rankings of the two sectors by physical and value factor intensities coincide. More

¹Formally, the expression linking the change in the ratio of returns to capital and the capital stocks is shown by:

$$\hat{r}_1 - \hat{r}_2 = - \frac{|\lambda| |\tilde{\theta}|}{\Delta \theta_{K1} \theta_{K2}} (\hat{K}_1 - \hat{K}_2),$$

where Δ , the aggregate economy-wide elasticity of demand for labor (as of fixed capital stocks) with respect to the free wage rate is:

$$\Delta \equiv \alpha_1 \lambda_{L1} \frac{\sigma_1}{\theta_{K1}} + \alpha_2 \lambda_{L2} \frac{\sigma_2}{\theta_{K2}}.$$

In this expression σ_j is the elasticity of substitution in sector j , and therefore (σ_j / θ_{Kj}) is the elasticity of demand for labor in sector j with respect to the wage rate in that sector. The term α_j links sector j 's wage rate to the free wage.

generally, we should not expect the sign of $|\theta|$, which measures the relative importance of wages in each sector in an average sense, to play any role in the adjustment process. It matters only with proportional (or zero) wage differentials, when it coincides with the sign of $|\tilde{\theta}|$, which measures the relative vulnerability of each sector to wage changes at the margin.

(ii) Absolute Wage Differentials: The case of a specific rather than an ad valorem wage differential has not been studied extensively in the literature, with the exceptions of Dixit and Norman (1980, chapter 5) and Schweinberger (1979). This is ironic, since it turns out always to be consistent with stability and thus to be much simpler than any of the other forms of labor-market distortions which have been considered. Recall that when w_1 equals w_2 plus a constant, α_j equals $1/w_j$. Substitution into (2.5) reveals that the measure of relative wage sensitivities, $|\tilde{\theta}|$, has the same sign as $|\lambda|$. It therefore follows from the proposition that an equilibrium with this form of labor-market distortion is always locally stable.

(iii) Sector-Specific Minimum Wages: In this case the wages in the two sectors are not directly related at all. As previously noted, if one sector is bound by a minimum wage, the other sector must be the wage-sensitive sector. Thus, as the relevant corollary of the theorem, a necessary and sufficient condition for local stability is that the minimum-wage sector must be capital-intensive in physical terms. For example, if the minimum wage obtains in sector 1, $|\tilde{\theta}|$ is negative and, for stability of the capital reallocation process, $|\lambda|$ must be negative as well.

This concludes our consideration of the issue of local stability. A different issue of considerable importance concerns the price-output responsiveness of the economy in the presence of a general labor-market

distortion of the form of (2.1). By manipulating the equations of the two-sector model in the manner developed in Jones (1965 and 1971a) it is straightforward to show that output response with respect to own price in either sector is positive if and only if the wage-sensitive sector is physically labor-intensive.² Hence, as in Neary (1978), local stability of equilibrium implies a normal price-output response whatever form the labor-market distortion takes.

3. Sector-Specific Minimum Wages

We turn next to examine in more detail the global as well as local implications of particular special cases of the general wage distortion shown by equation (2.1). The first case we consider is where a minimum wage is imposed in only one of the two sectors.³ This does not lead to unemployment.

²The formal solution for the change in relative outputs when p_1 rises and p_2 is constant is shown by:

$$|\lambda| |\tilde{\theta}| (\hat{X}_1 - \hat{X}_2) = \phi_1 \phi_2 [(\alpha_1 \theta_{K2} + \alpha_2 \theta_{L2}) \delta_1 + \alpha_2 \delta_2] \hat{p}_1$$

where $\phi_j = (\theta_{Lj} \alpha_j + \theta_{Kj})^{-1}$ and $\delta_j = (\theta_{Lj} \lambda_{Kj} + \theta_{Kj} \lambda_{Lj}) \sigma_j$, the elasticity of aggregate demand for capital relative to labor with respect to the wage/rental ratio in sector j . Except for the presence of some additional terms in α_1 and α_2 , the coefficient of \hat{p}_1 is identical to that in the absence of labor-market distortions; in any case it is clearly positive.

³Previous studies of this case include Johnson (1969) and McCulloch (1974). The literature on urban unemployment in developing countries is also relevant;

Instead, the wage in the undistorted sector adjusts to equate that sector's demand for labor with the residual supply.

Suppose first that the minimum wage is imposed in the relatively capital-intensive sector. The economy's response is shown in Figure 1, which combines the standard labor-market diagram in the left-hand panel with the unit cost curve diagram in the right-hand panel.⁴ Initial equilibrium in the absence of any minimum-wage distortion is represented by points A and A'. We assume that sector 1 is relatively labor-intensive, so that the c_1 curve is flatter at A' than the c_2 curve. Suppose now that a minimum wage which is not "too far" above the competitive level is imposed in sector 2. In the short run employment in that sector is reduced as its production point moves to B and the laid-off workers are rehired in sector 1 at a wage rate lower than the initial equilibrium level, as shown by point C. With one sector paying a higher wage and the other a lower one, a rental differential must have emerged in favour of sector 1, and this is shown by the points B' and C' in the right-hand panel. Capital therefore begins to leave the high-wage sector 2. As it does so, the expansion of the relatively labor-intensive sector 1 leads to a tightening of the labor market. Only the wage in sector 1 is free to adjust and so it rises during the adjustment process, reducing the

see Harris and Todaro (1971), Corden and Findlay (1974), Khan (1980) and Neary (1981). Although unemployment emerges as an equilibrium phenomenon in these models, they are best understood as applications of the sector-specific minimum wage model. With a minimum wage in manufacturing (so that it is the wage-insensitive sector) stability requires the urban sector to be "capital-intensive" (as indicated by the ratio of its capital stock to the manufacturing workforce plus the urban unemployed).

⁴This diagrammatic technique was used by Jones and Neary (1984).

intersectoral rental differential and so tending to restore the capital market to equilibrium. The adjustment process is shown by the arrows in the right-hand panel of Figure 1 and ends when sector 1 reaches point D. Note that the wage in that sector initially overshoots its new long-run equilibrium level; and note also that there is no obstacle preventing stable convergence towards a new long-run equilibrium at which both goods are produced.

The only difficulty which may emerge when a minimum wage is imposed in the relatively capital-intensive sector is when the wage is sufficiently high to force that sector to cease production. In Figure 1, this occurs if the wage is at or above the level indicated by the point F. This point lies vertically above E_1 , which we assume is the point on sector 1's unit cost curve where the capital-labor ratio in that sector equals the endowment ratio in the economy as a whole. If the minimum wage is set above point F, the short-run response of outputs and rentals to the imposition of the minimum wage will be as already indicated, and the resulting capital reallocation moves the economy closer to capital-market equilibrium. However, before that can be attained, sector 1 absorbs all the factors of production in the economy and so specialisation in production takes place, with factor returns denoted by point E_1 .

A very different outcome ensues when the minimum wage is imposed in the relatively labor-intensive sector.⁵ As shown by points B and C in Figure 2, the labor-intensive sector 1 contracts in the short run and the residual labor is rehired by sector 2 at a wage below the initial equilibrium level. At the

⁵Some of the difficulties which emerge in this case have been noted by McCulloch (1974) and Carruth and Oswald (1982).

corresponding points B' and C' in the right-hand panel, the rental differential is again in the expected direction, and it encourages a reallocation of capital out of the high-wage sector 1 into sector 2. In this case, however, by contrast with the last, the expanding sector is physically capital-intensive, which tends to reduce the demand for labor in the economy as a whole. As a result, the only wage rate which is free to adjust, that in sector 2, falls during the adjustment process. But this tends to raise the rental in that sector and so to widen the intersectoral rental differential. As shown by the arrows in Figure 2, this process continues until point E_2 is reached; sector 2 has now absorbed all the economy's factor endowment and production of good 1 has ceased.

This outcome illustrates the result of Section 2 that an equilibrium with a minimum wage imposed in the relatively labor-intensive sector is necessarily unstable and so will not be approached; the minimum wage has made the labor-intensive sector completely wage-insensitive. However, an even more striking feature of this case may be noted from Figure 2: the only long-run outcome consistent with capital-market equilibrium and with sector 1 paying the new minimum wage is represented by points D and B'. But this is not a feasible outcome in the labor market since there exists no barrier to an increase in the wage in sector 1 or a decrease in the wage in sector 2.

Crucial in the analysis thus far is the comparison between physical factor intensity and wage sensitivity rankings. However, the physical factor intensity ranking itself is not independent of the minimum wage. In Figure 2, a minimum wage at or above the level indicated by the point E_1 (where the slope of c_1 at point E_1 indicates the economy's endowment proportions)

reverses the physical factor-intensity ranking of the two sectors. In the short run the capital-labor ratio in sector 1 exceeds that in the economy as a whole and, since both factors are fully employed throughout, the capital-labor ratio in the other sector must be below the endowment ratio. The minimum wage (and so wage-insensitive) sector has now become capital intensive, but this does not mean that an unspecialised equilibrium can be attained. In the short-run equilibrium sector 2 lies below point E_2 on its unit cost curve and, as capital flows into it over time, the wage rate there rises. The rental differential is therefore narrowed by the reallocation, but before it is eliminated sector 2 absorbs all the economy's endowment and sector 1 is eliminated. Thus the only difference which a physical factor-intensity reversal makes in this case is that the new long-run equilibrium, E_2 , is approached from below rather than from above, as the arrows in Figure 2 indicate.

4. Sector-Specific Real Wage Ceilings

The cases discussed above have involved distortions which yield intersectoral differentials in nominal wages in economies where all commodities are traded at fixed world prices. We turn now to a case of government interference in factor markets in which the nominal wages in the two sectors of the economy are kept fixed and equal to each other, but with one of the commodities non-traded. As a consequence, the real wage in one sector is flexible, making the concept of wage sensitivity and its relationship with that of physical labor intensity again useful in exploring

the transition from a short-run equilibrium as capital becomes intersectorally mobile.

Suppose the government responds to a rise in price in the traded goods sector (p_T) by taxation and expenditure policy whose aim is to affect the price of goods in the non-traded sector (p_N) in whatever manner required to keep the (uniform) wage rate from rising. In an analysis by Jones and Corden (1976) of various policies designed to accompany exchange rate changes for a small open economy, the rise in the price of tradeables was identified with a devaluation of the currency. Here we dispense with the interpretation in terms of exchange markets and consider only an exogenous rise in the price of tradeables. The government is assumed to interfere in the private market with tax or spending policies in order to determine the price of non-tradeables. As opposed to our treatment in the next section of an economy-wide minimum wage which produces unemployment, in our present scenario the wage rate clears the labor market.

A simpler type of government policy examined by Jones and Corden, one which stabilizes the price of non-tradeables instead of the wage rate in the face of a given rise in the price of tradeables, provides a useful background to our analysis. With such a policy, the transition from short to long-run equilibrium is stable regardless of factor-intensity rankings. To see why, note that with no wage distortions, the rankings of industries by wage sensitivity and by labor intensity coincide. In the short-run equilibrium in which capital is specific to each sector, a policy of pegging the price of non-tradeables when p_T rises causes the wage rate to rise and the return to capital in non-tradeables (r_N) to fall. The rental in tradeables (r_T) has, of

course, gone up by more than the price of tradeables so that the signal clearly implies a reallocation of capital (and labor) towards tradeables. If tradeables are labor-intensive, the extra demand for labor which is thus created exerts upward pressure on wages and, at constant commodity prices, squeezes rentals in both sectors. The rental is driven down by more in the wage-sensitive tradeables sector. Thus both rentals eventually fall towards each other and the wage rate approaches its long-run equilibrium value (with $\hat{w} > \hat{p}_T > \hat{p}_N = 0 > \hat{r}$).⁶

The difficulty emerges if the government targets the nominal wage rate instead of the price of non-tradeables. In the case in which tradeables are labor-intensive, such a ceiling on wages in effect converts the capital-intensive non-tradeable good into the wage-sensitive commodity and, during the capital reallocation process, the policy drives the return to capital in non-tradeables ever downwards and further from the return to capital in tradeables. As before, the initial rise in p_T puts upward pressure on the labor market, and the authorities now are presumed to counter this by an appropriate tax policy that causes the price of non-tradeables to fall sufficiently to keep a lid on wage rates. During the adjustment process as capital (and labor) flow from non-tradeables towards labor-intensive tradeables, upward pressure is created in the labor market. To avoid a wage increase, the government now must drive down the price of non-tradeables so that the labor market clears at the initial wage. Such a fall in p_N drives

⁶The case in which tradeables are capital-intensive is also stable, with the long-run equilibrium such that $\hat{r} > \hat{p}_T > \hat{p}_N = 0 > \hat{w}$.

down r_N (just as did the alternative policy of allowing an increase in the wage rate). But r_T is now insulated. The upward pressure in the labor market has been syphoned off completely by the policy-prescribed fall in p_N that serves to keep a ceiling on wage rates. Since the capital-intensive non-tradeables sector is now the wage-sensitive sector, the upward pressure in the labor market has pushed r_N down by relatively more than (unchanged) r_T .⁷ This scenario reveals that certain policies which interfere with factor markets are inappropriate because they run afoul of the adjustment process whereby capital and labor reallocations exert pressure on factor markets.

The setting described in this section is closely analogous to the case considered in the preceding section in which a minimum wage is imposed in the labor-intensive sector. In that analysis the labor market is cleared by a fall in the real wage faced by employers in the capital-intensive sector -- such a fall taking the form of a lowering of the wage rate in that sector with commodity prices fixed. In the present setting the excess demand created in the labor market when the price of tradeables rises is eliminated by an increase in the real wage faced by employers in the capital-intensive non-tradeables sector -- but with such an increase taking the form of a

⁷ Jones and Corden (1976) point out that a policy of devaluation when tradeables are labor-intensive and the wage rate is fixed is associated with a long-run equilibrium in which rates of return to capital are equated at a higher level than originally and in which the price of non-tradeables rises by more, relatively, than the initiating rise in tradeables. Thus in the long run $\hat{r} > \hat{p}_N > \hat{p}_T > \hat{w} = 0$. Such a devaluation is unsuccessful in two different senses: at the new long-run equilibrium since tradeables are relatively cheaper the nominal devaluation represents a real appreciation; and in any case the adjustment process from the initial short-run equilibrium drives the economy ever further from the long-run equilibrium.

lowering of the commodity price for non-tradeables with the nominal wage fixed. In each case the rates of return to capital are driven further apart during the capital reallocation process; the policy (minimum wage imposed in the labor-intensive sector or an imposed overall wage ceiling supported by continued falls in the price of the capital-intensive good) serves to convert the physically labor-intensive sector into the wage-insensitive sector.

5. An Economy-Wide Minimum Wage

The final case we consider, an economy-wide minimum wage set above the free-market level, shares with the preceding section a setting in which nominal wage rates are uniform throughout the economy, and policy is directed towards targetting the level of wages. It differs, however, in that both commodities are traded so that no flexibility is allowed in factor returns. As a consequence, the labor market does not clear.⁸ In analyzing this case we focus on the difference which may be made by the level at which the minimum wage is imposed. Once again, a variation on the interplay between wage-sensitivity rankings and physical labor-intensity rankings proves crucial in highlighting the effects of the capital reallocation process from a position of short-run equilibrium.

The situation in this two-sector, price-taking economy is pictured in Figure 3. We assume that the economy starts in competitive full employment equilibrium, as indicated by point A, with sector 1 relatively labor-intensive

⁸Previous treatments of this case include Haberler (1950), Johnson (1969), Lefeber (1971) and Brecher (1974).

(as shown by the fact that its unit cost curve is less steeply sloped than that of sector 2 at A). The response to the imposition of a minimum wage which is not "too far" above the competitive level is now easily illustrated. Assuming that the wage rises to a level denoted by a point such as D, the rentals in both sectors are squeezed in the short run. However, that in sector 1 falls by more: since the first sector is relatively wage-sensitive, its rental is more vulnerable to a wage increase. With capital sector-specific in the short run, both goods are still being produced in this economy, but now an incentive has emerged to reallocate capital out of sector 1 into sector 2. The striking feature of the economy-wide minimum wage case is that this reallocation of itself does not alter the rentals in either sector.⁹ They continue to encourage a reallocation of capital out of sector 1 and this process can end only when that sector loses all capital and ceases production.

The same sequence of events is illustrated from the perspective of the goods markets in Figure 4. Initial equilibrium is at point A', where the world price line is tangential to the full-employment production possibilities frontier TT, along which capital is mobile between sectors. In the short run, with capital fixed in each sector, the minimum wage creates unemployment and reduces the output of both goods as production moves to point D'. The subsequent capital reallocation then moves the production point along the Rybczynski line D'D'' until the economy specialises in the production of good 2

⁹In this respect, an economy-wide minimum wage has the same effects as the availability of internationally mobile capital at a given world rental, as pointed out by Neary (1985).

at point D". Note that the output of the capital-intensive good X_2 overshoots its new long-run equilibrium value during the adjustment period, first falling from point A' to D' and then rising to the level indicated by point D", which may lie above or below the initial level at A'. By contrast, the level of unemployment rises monotonically, initially because both sectors shed labor when required to pay a higher wage and, during the transition period, because the expansion of the relatively capital-intensive sector cannot absorb all the labor laid off by the declining labor-intensive sector.

It is intuitively plausible that the introduction of a minimum wage should drive the labor-intensive sector out of existence and this outcome is implied by the discussion in Brecher (1974). However, Figure 3 has deliberately been drawn to show that this outcome is by no means inevitable. Sector 1 has a higher elasticity of substitution between labor and capital than sector 2, so that while an increase in the wage rate induces both sectors to become more capital-intensive, this effect is more pronounced in sector 1. As a result, a sufficiently high minimum wage may lead to a physical factor intensity reversal: in Figure 3, the critical wage rate is that which leads the two sectors to points B and C, where their capital-labor ratios are equal to each other.¹⁰ If, from the initial equilibrium at A, a minimum wage is

¹⁰We have also indicated in Figure 3 that the value factor intensity ranking gets reversed at a wage rate higher than that required to reverse physical factor intensities. The critical value of the wage rate at which the value shares in the two sectors are equalized is shown in Figure 3 by the points E and F, since tangents from the two unit cost curves at these points intersect the vertical axis at the same point, M. (See Jones and Neary (1979) and Mussa (1979) for details of this geometric construction.) However, it should be stressed that this reversal has no substantive implications for the behavior of the model.

imposed at a higher level, say that represented by point G, the incentive to reallocate capital is the same as before, and so sector 1 will eventually be eliminated. However, that sector has now become relatively capital-intensive and so its decline leads to a fall in unemployment during the transition period. This corresponds to the move from G' to G'' in Figure 4.

If the minimum wage is set above the level OI at a point such as J, the path of adjustment is significantly altered. The rental differential now favors sector 1 and so capital leaves sector 2 until that sector ceases production. In this case, the economy again specializes in the production of the relatively capital-intensive good and so unemployment rises during the adjustment process. The adjustment path is shown by the line J'J'' in Figure 4.

In conclusion, note that the concept of wage sensitivity and its potential lack of correspondence with physical labor intensity can be applied to the cases we have just described. However, a global interpretation of wage sensitivity rankings is required. The definition given in Section 2 continues to apply, but now the wage-sensitive sector is the sector whose rental is squeezed more not by a small change in wages, but by the imposition of the minimum wage. Figure 3, which incorporates the reversal of the physical labor-intensity ranking (at N), also shows the possibility of a reversal of the wage-sensitivity ranking, but at a different minimum wage rate (at I). If these two rankings coincide, unemployment rises during the capital reallocation process; otherwise (for minimum wages set between ON and OI) unemployment falls.

6. Concluding Remarks

Disturbances in labor markets have differential effects on the returns to co-operating capital. A physical factor-intensity ranking between sectors, of the type long familiar in international trade models, serves to indicate these differences when factor markets are undistorted. However, the existence of policies aimed at affecting wage rates in one or both sectors may introduce distortions which require a new concept - that of a wage-sensitivity ranking - to indicate the sector in which capital's return is more severely depressed by upward pressure in the labor market. This concept allows not only for a premium to be paid to workers in one sector but also for differences in the allowable response of wages in each sector to disturbances in the labor market. For given commodity prices the emergence of excess supply in the labor market would generally be of benefit to capital - especially in the wage-sensitive sector of the economy. Thus a wage-sensitivity ranking indicates the direction in which capital gets reallocated during the transition period, and the physical labor-intensity ranking reveals the consequences of such reallocations on excess demand or supply of labor. Our basic result is that the transition from short-run equilibrium converges to the corresponding long-run equilibrium only if these two rankings correspond.

In this paper we have considered a variety of labor-market distortions ranging from proportional or absolute wage differentials between sectors to sector-specific minimum wages and to policies aimed at preventing the real wage in some sector from rising. In all these cases the wage rate in at least one sector is free to vary, thus guaranteeing full employment. In Section 5

we considered an economy facing given world prices and imposing a uniform minimum wage that precluded an adjustment of factor prices during the transition period. The concept of wage-sensitivity nonetheless proved of value -- this time to indicate that the unemployment created by the minimum wage was rendered more acute by the capital reallocation during the transition phase if the wage-sensitivity ranking of sectors corresponded to that of labor-intensity.

That the intention of a policy designed to improve the welfare of certain groups can be thwarted by the resulting transitional reallocations is well illustrated by the case of a sector-specific minimum wage. If the sector in which this wage floor is imposed is capital-intensive, the policy succeeds not only in raising the wages of those in the targetted sector, but wages in the other sector as well (although not by as much). By contrast, if the minimum-wage sector is labor-intensive, workers there may benefit in the short run, but once capital gets reallocated this sector gets wiped out and, as well, the wage rate in the other sector falls below its initial level. The intentions behind such a policy are completely frustrated by the transitional capital reallocations in this case because the wage-sensitive sector (which cannot be the minimum-wage sector) is capital-intensive.

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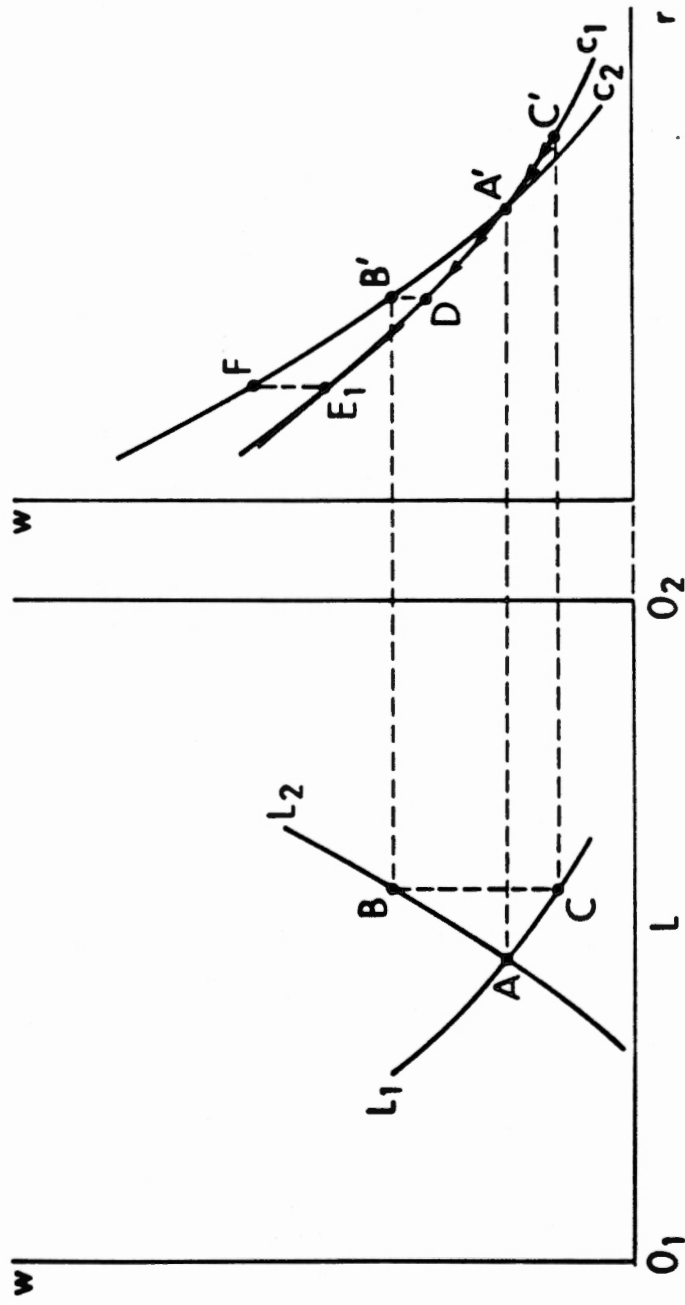


Figure 1

Effects of a Minimum Wage in the Capital-Intensive Sector

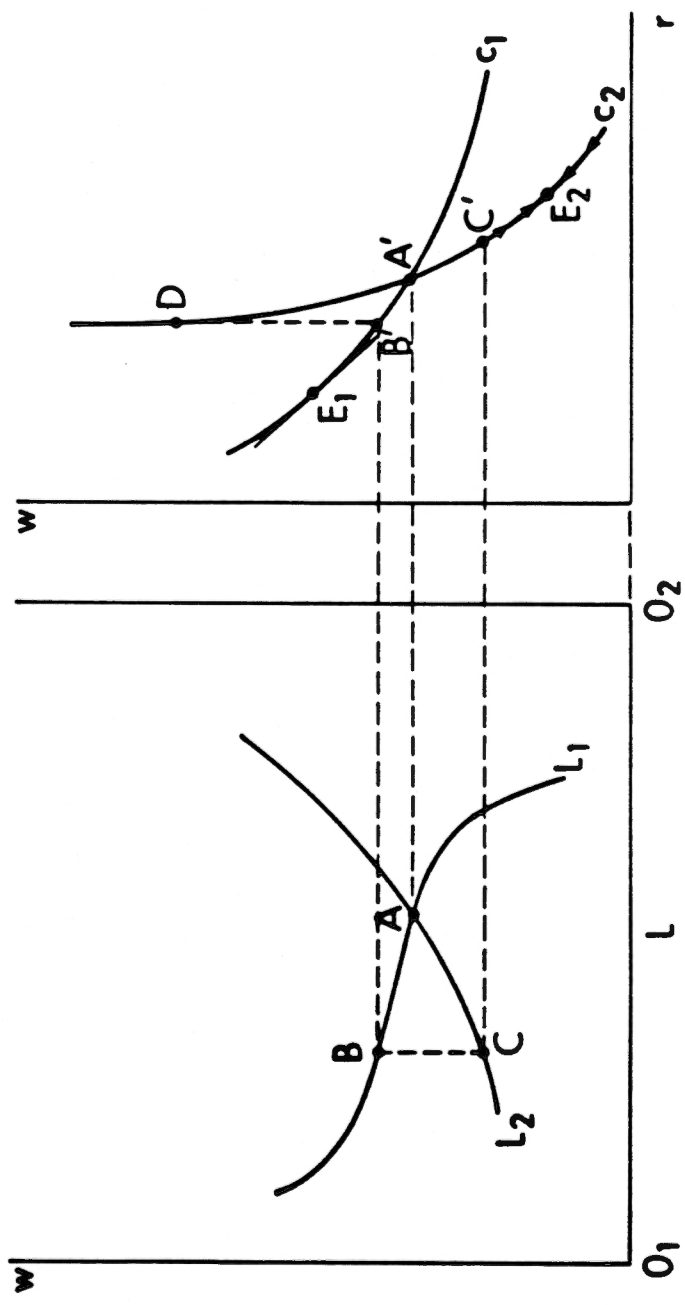


Figure 2

Effects of a Minimum Wage in the Labour-Intensive Sector

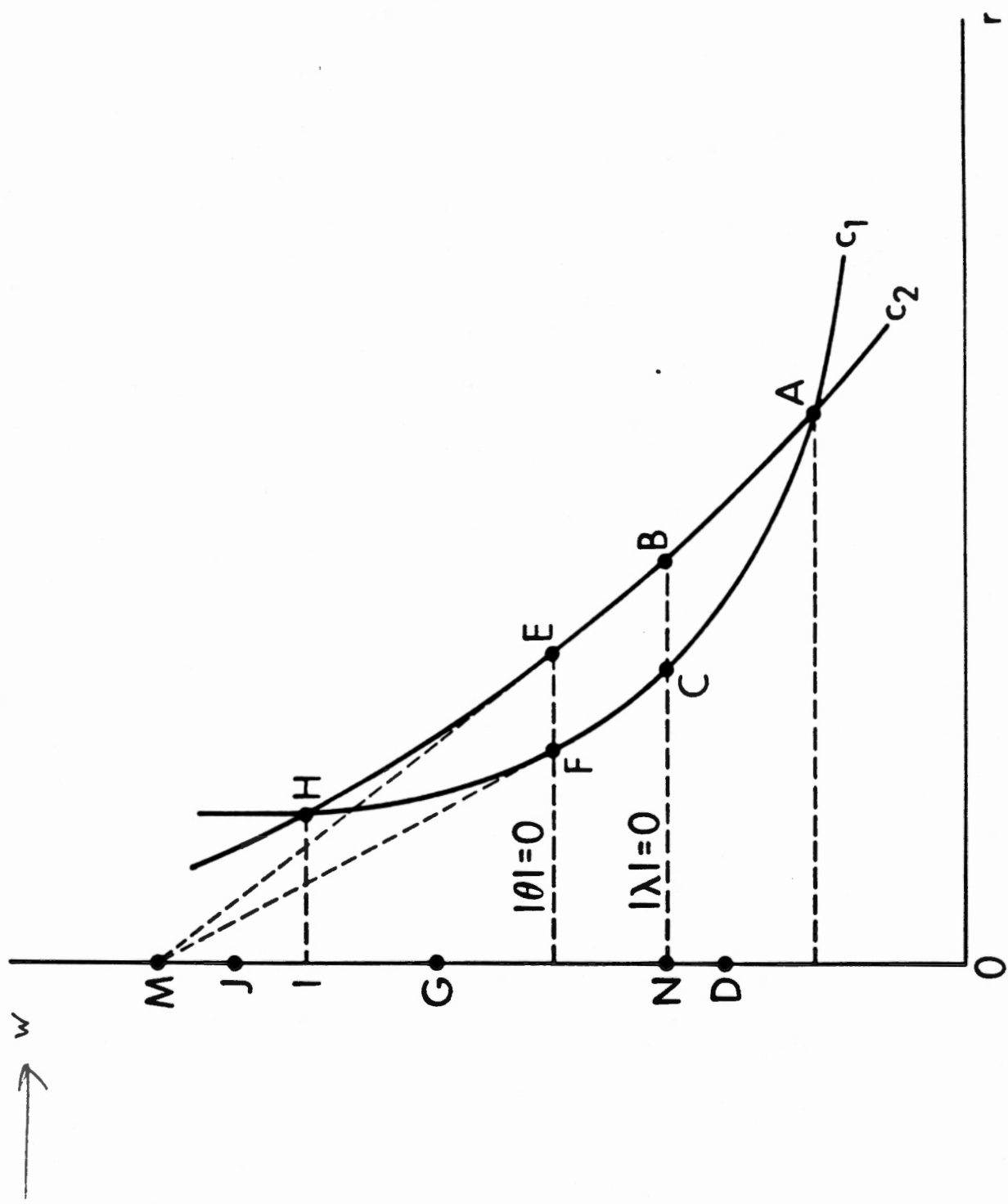


Figure 3

Factor-Price Effects of an Economy-Wide Minimum Wage

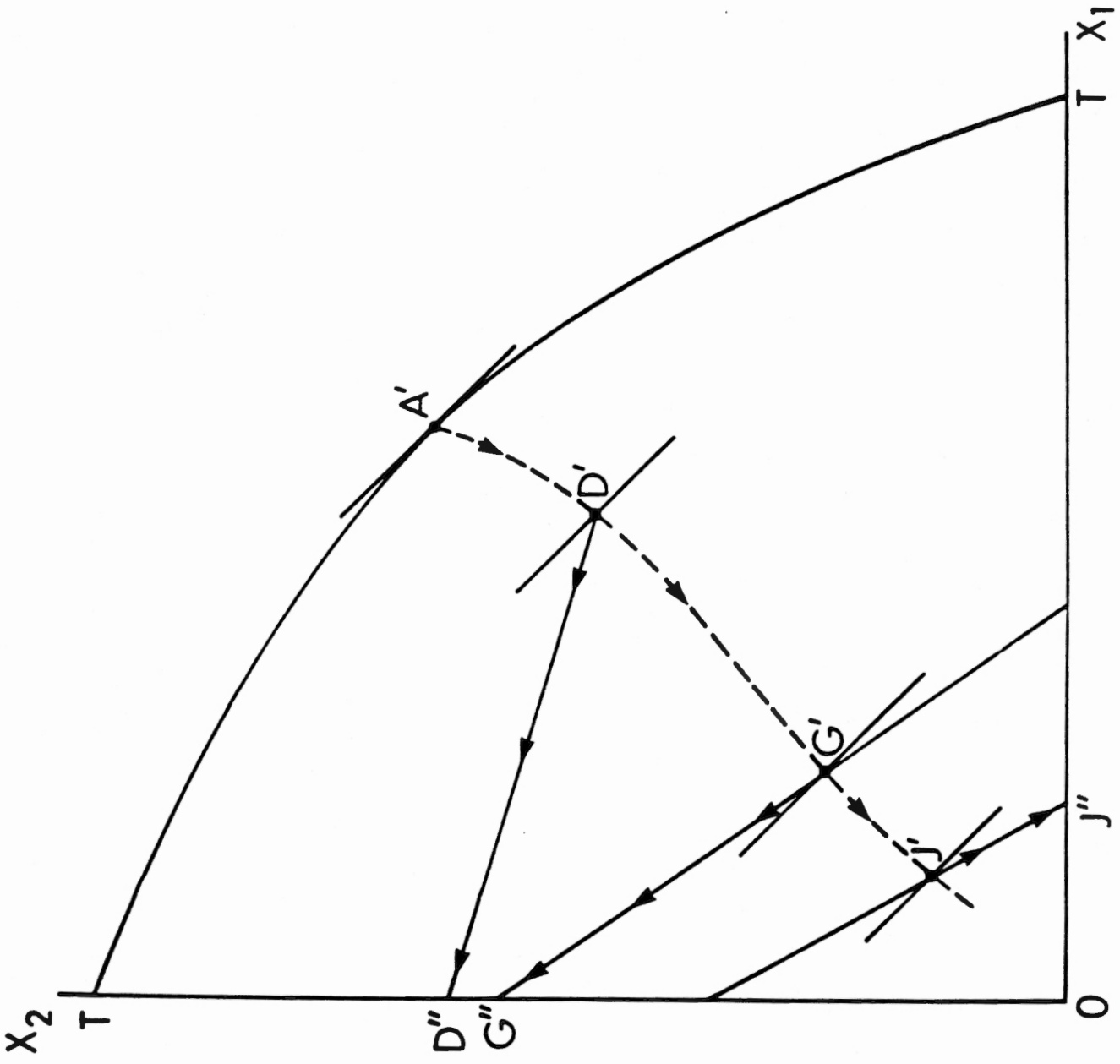


Figure 4

Output Effects of an Economy-Wide Minimum Wage

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