Trade Openness: Consequences for the Elasticity of Demand for Labor and Wage Outcomes

Arvind Panagariya*

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*Department of Economics, University of Maryland, College Park, MD 20742. Email: Panagari@econ.umd.edu. I am indebted to Jagdish Bhagwati, Don Davis, Alan Deardorff, and Dani Rodrik for comments on an earlier draft.

Abstract

Leamer (1995), Rodrik (1997) and Wood (1995) have suggested, without qualification, that the demand-for-labor curve is more elastic when an economy is open than when it is closed. I demonstrate that this proposition is not valid in general. The proposition can be violated in both the 2x2 and specific-factors models. Furthermore, many of the results obtained by Rodrik (1997), assuming the proposition to be true, fail to hold in general when we spell out the full structure of the model.

Thus, within two most popular models of trade--the 2x2 and specific-factors models--, there is no guarantee that openness leads to a greater incidence of higher labor standards being borne by workers or to greater volatility in wage earnings as a consequence of shocks to the economy. It is also not true in general that when openness lowers the bargaining power of workers, it contributes negatively to wages. In the 2x2 model, exactly the opposite may happen.

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1. Introduction

Recently, Leamer (1995), Wood (1995) and Rodrik (1997) have postulated, without qualification, that the demand-for-labor curve is more elastic when an economy is open than when it is closed. Using the fixed-coefficients version of the 2x2 Heckscher-Ohlin model, Leamer (1995, Diagrams 1 and 2) shows that the demand for labor in a small, open economy is perfectly elastic over the intermediate range characterized by incomplete specialization in production. Without proof, he then postulates that, if the economy is closed, the demand for labor is downward sloped over an intermediate range that overlap partially with the perfectly elastic range derived for the small, open economy case. Based on this construction, Leamer shows that the real wage for a labor-scarce economy must be higher in a closed than an open economy. In a symposium on trade and wages in the *Journal of Economic Perspectives*, Wood (1995) also adopts and reproduces this theoretical framework.

More importantly, in his provocatively titled book, *Has Globalization Gone too Far?*, taking the proposition that labor demand is more elastic in an open than closed economy, Rodrik offers three propositions, all implying that openness hurts the interests of unskilled workers. Thus, without qualification, Rodrik offers the following conclusions:

(i) The more open an economy, the greater the reduction in the wage received by workers as a result of the introduction of a higher labor standard.

(ii) The more open an economy, the greater the volatility in both earnings and hours worked resulting from shocks to labor demand.

(iii) The greater the openness, the less the bargaining power of workers and, hence, the lower the wages of workers.

In this paper, I have two objectives. First, I take issue with the basic Leamer-Rodrik-Wood proposition that the demand-for-labor curve is necessarily more elastic in an open than a closed economy. I derive the demand for labor in *both* the open- and closed-economy settings and demonstrate that one cannot, in general, draw a direct relationship between the degree of openness and the elasticity of demand for labor. While it is possible for an appropriately-defined labor-demand curve to be more elastic in an open than a closed economy, under standard assumptions, it is equally possible for the opposite to be true.[1]

Second, I argue that, at least on theoretical grounds, none of Rodrik's propositions is valid in general. Drawing on the existing theoretical literature, based on standard assumptions, I offer examples under which the outcome is exactly opposite of what Rodrik (1997) predicts for each of his three assertions.

I am able to demonstrate the failure of Rodrik's propositions to hold in general in both the two-factor, two-sector model and the specific-factors model. The 2x2 model on which the Heckscher-Ohlin theory is based remains by far the most popular model among trade economists. It is, nevertheless, criticized sometimes for exhibiting peculiar and extreme properties. For instance, the Stolper-Samuelson theorem which says that a reduction in the price of the labor-intensive good leads to a proportionately larger reduction in the return to labor and a rise in the return to the other factor is thought to be a rather extreme result. The specific-factors model, by contrast, is regarded as more plausible, yielding results that are generally consistent with our partial-equilibrium intuition

[1]Moreover, the question of probability of outcomes cannot be determined outside of specific

[for example, see Neary (1978)]. A rise in the price of a good in this model leads to a proportionately smaller increase in the wage. My demonstration that Rodrik's propositions can be invalidated in the 2x2 as well as the specific-factors model should lay to rest potential criticisms that the analysis merely exploits the extreme properties of the 2x2 model.

The broader concern that increased international mobility of one factor (for example, capital or skilled labor) may affect adversely the fortunes of another factor (for example, unskilled labor) which is immobile is not entirely new. In the 1960s and 1970s, similar concerns had been expressed in the developing countries, which feared that the linking of the wage of their skilled workers to the corresponding wage in the global marketplace would adversely affect the unskilled. Bhagwati and Hamada (1974) formally analyzed this phenomenon in the context of the literature that developed under the rubric of "brain drain". Using the Harris-Todaro model, they studied the impact of skilled labor's integration into the global economy on the wages and unemployment of the unskilled.[2]

The paper is organized as follows. In Section 2, the shape of the labor-demand curve in open and closed economies is considered in the 2x2 and 3x2 models. Though the main focus is on trade openness, the implications of capital mobility are also considered briefly. In Section 3, a direct analysis of the implications of openness for wage outcomes is provided. It is shown that the above-mentioned propositions of Rodrik are not valid in general. In Section 4, the paper is concluded.

2. Openness and the Demand-for-Labor Curve

Before I proceed to demonstrate that the demand-for-labor curve need not be more elastic in

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model structure and cannot therefore be answered at a general level.

[2]Ironically, the policymakers and economists in developing countries have generally abandoned these pessimistic or "malign-impact" attitudes whereas Rodrik's (1997) contribution is representative of the recent embrace of such "anti-globalization" fears in the developed

an open economy than in a closed one, it is useful to summarize the precise approaches taken by the authors who have argued otherwise. Leamer (1995) casts the problem within a two-good, two-factor, general-equilibrium framework in which the factors are labeled skilled and unskilled labor. He derives formally the economy-wide demand curve for unskilled labor relative to that for skilled labor as a function of the real wage measured in terms of the labor-intensive good. He assumes the country is open and small. Leamer does not derive formally the demand for labor in a closed economy, however. Instead, he relies on heuristic arguments to support the less elastic curve drawn under autarky. Wood (1995) takes Leamer's construct as given and applies it to the analysis of the effect of trade on wages. Both Leamer (1995) and Wood (1995) are explicit in defining openness in terms of goods trade rather than international capital mobility.

Rodrik (1997, chapter 2) begins the analysis with a partial-equilibrium diagram, focusing on the demand for and supply of labor in a specific sector. Only heuristic arguments, rather than a formal derivation, are offered to rationalize the more elastic demand-for-labor curve in his analysis insofar as *trade* openness is concerned. The only formal analysis is provided in Appendix A but that relates to openness to international *capital* flows, the comparison undertaken with trade openness with and without capital mobility. Because the economy is assumed to be fully open to goods trade at all times, this analysis, which is strictly limited to studying the implications of capital mobility for the wage response in an open economy, says nothing about the impact of trade openness on the wage response.

2.1 Trade Openness and the Elasticity of demand for Labor

The labor demand curve naturally depends on the underlying model. Before I consider its

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countries. See the Prebisch Lecture by Bhagwati (1996).

derivation in the 2x2 and specific-factors models, it may be noted that the partial-equilibrium approach to wage determination, employed by Rodrik in chapter 2 of his book, is a non-starter. Rodrik works with the demand for and supply of labor relating to a *specific* sector to determine the wage. But this approach is valid only if the type of labor in question is specific to that sector, as may be the case with aeronautical engineers or nuclear physicists. But Rodrik's concern is with unskilled labor about which there is consensus that it is a factor common to many sectors. Empirical work on trade and wages identifies unskilled labor with either production workers or workers having education and experience below a certain threshold. On either basis, unskilled workers are employed in a variety of sectors. Once this is recognized, the case for studying wage determination in general rather than partial equilibrium is compelling.[3]

The Two-Factor Model

Consider a two-sector, two-factor, small, open economy. Let the two factors be labeled S and L where S stands for skilled labor and L for unskilled labor. Denote the two goods by 1 and 2 and let good 2 serve as the numeraire. Assume further that good 1 uses skilled labor more intensively, i.e., for a given set of factor prices, $S_1/L_1 > S_2/L_2$ where S_i and L_i are the quantities of skilled and unskilled labor used in sector i. Given the relative price from the world market, the unit-cost pricing conditions allow us to determine the factor prices. Thus, representing by s and w the skilled and unskilled wage, respectively, by p the relative price of good 1 in terms of good 2, and by $c_i(w, s)$ the unit-cost function for good i, we solve

[3]One may argue that the partial-equilibrium approach can be justified by interpreting the labor supply curve relevant to the sector under consideration as the total labor endowment minus the demand for labor by all other sectors. But under this interpretation, we will also have to take into account the impact of openness on the elasticity of labor supply. Additional problems arise

(1a) $c_1(w, s) = p^0$ and

(1b) $c_2(w, s) = 1$

to obtain w^0 and s^0 as equilibrium unskilled and skilled wage in terms of good 2.

Next, letting $X_i = F_i(S_i, L_i) \equiv L_i f_i(S_i/L_i)$ be the linear-homogeneous production function for good i, we can obtain the optimal S_i/L_i ratio by solving the following first-order condition of optimization by the firm.

(2) $w = p^0[f_i'(.) - (S_i/L_i)f_i''(.)]$.

Substituting $w = w^0$, we can solve this equation for the optimal S_i/L_i ratio, which is represented by OA_i in the upper panel of Figure 1. Since sector 1 uses skilled labor more intensively, OA_1 is steeper than OA_2.

To derive the demand curve for unskilled labor, we ask the following question: what is the wage rate consistent with a given quantity of L along the labor-demand curve? We address this question by taking the goods price and the quantity of S fixed at p^0 and S^0, respectively. Thus, in the upper panel of Figure 1, suppose we wish to know the wage rate at which the quantity of labor demanded is L^0. This quantity of labor places the economy on point E^0 which lies in the diversification cone A_1OA_2. It is then immediate that the wage rate, which allows the economy to absorb L^0, is w^0. In the lower panel of Figure 1, measuring the quantity of labor on the horizontal axis and the wage in terms of the numeraire on the vertical axis, we obtain Q^0 as the point on the labor-demand curve. By a similar argument, it is easy to see that, for quantities of labor lying on segment B_1B_2 in the upper panel, the wage rate along the demand curve remains w^0. Therefore, we obtain segment Q_1Q_2 on the labor demand curve in the lower panel.

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which will become clear when I consider the specific-factors model.

What happens to the wage rate when the quantity of labor is outside the diversification cone? Thus, suppose the quantity demanded lies to the right of B_2 as shown by L' in the upper panel of Figure 1. This places the economy on point E', which lies outside the diversification cone A_1OA_2. At such a point, it becomes unprofitable to produce good 1 and all resources must be absorbed by sector 2. The ratio of skilled-to-unskilled labor in sector 2 coincides with E'. We can now obtain w^0 by substituting $S_2/L_2 = S^0/L'$ in equation (2) for i = 2. It can be verified that $w' < w^0$.[4] Thus, the point on the labor-demand curve in the lower panel of Figure 1 can be represented by Q'. In general, as the wage falls, the associated quantity of labor demanded moves further to the right of B_1, while as the wage rises, the associated labor demanded moves further to the right of B_1. The labor-demand curve has the shape shown by $D_L{}^T D_L{}^T$ in the lower panel of Figure 1. This labor-demand curve is similar to that derived by Leamer (1995) for a small, open economy, the only difference being that he measures the *ratio* of labor to capital on the horizontal axis and assumes a constant coefficients technology.

The key question that confronts us is how this demand curve differs from the one that will obtain in the absence of trade. At one level, it may be argued openness has little to do with the labor-demand curve. Conventionally, the labor-demand curve is drawn for given vectors of goods prices and quantities of other factors used. Recall, for example, that under perfect competition, microeconomics textbooks typically identify the labor-demand curve with the value of the marginal product, which is defined for given goods prices and quantities of other factors. Under this interpretation, the labor demand curve depends on the chosen goods prices and quantities of other

[4]From 2, we can verify that w declines as S_i/L_i declines. For endowments inside the diversification cone (including its boundary), S_2/L_2 is given by OA_2. For endowments strictly below OA_2, S_2/L_2 is flatter than OA_2.

factors but not on whether the economy is open or closed.

Formally, suppose we write the revenue function in the standard form [Dixit and Norman (1980), chapter 2]: $R(p_1, p_2, S, L)$, where R(.) is convex in prices and concave in factor endowments. The inverse-demand function for unskilled labor is then given by $w = R_L(p_1, p_2, S, L)$ where $R_L(.)$ represents the first partial of R(.) with respect to the quantity of labor. As long as we evaluate $R_L(.)$ at the same goods prices and S, the labor demand function is the same irrespective of whether the economy is open or closed. Admittedly, the prices under autarky and free trade will differ. But that merely requires us to evaluate $R_L(.)$ at different prices in the two cases. There is no presumption that this fact gives rise to a higher elasticity of demand in one case than the other.

To relate the elasticity of demand for labor to the degree of openness, we must therefore define the labor-demand curve in a way that it takes into account the changes in the goods prices that accompany different levels of labor demand.[5] Such a definition leaves the labor-demand curve derived for a small open economy in Figure 1 unchanged but requires modification for a closed (or large, open) economy.[6] The key question is whether this modification *necessarily* results in a less elastic demand curve than the one obtained for a small, open economy.

To show that the answer to this question is in the negative, consider the upper panel of

[5]While this definition allows us to relate the labor-demand curve to the degree of openness, it gives rise to a different problem. The movements in the wage in terms of the numeraire good along the vertical axis are not matched identically by movements in the wage in terms of the other good. In the present 2x2 model, a 10% rise in the wage in terms of the numeraire gives rise to a less than 10% rise in the wage in terms of the other good if the latter's price is rising. This problem becomes more serious in the specific-factors model since in that model a rise in the price of a good is accompanied by a rise in the wage in terms of the other (numeraire) good but a decline in it in terms of itself.

[6]I limit the analysis in this paper to comparing the labor demand between two extremes: complete autarky and a small, open economy. The intermediate case of a large, open economy can be easily accommodated into our analysis.

Figure 2 which shows the economy's production possibilities frontier for an initial endowment vector (S^0, L^0). We denote the outputs of goods 1 and 2 by X_1 and X_2, respectively. Suppose the autarky equilibrium is at A_0, yielding p^0p^0 as the equilibrium autarky price. For ease of comparison, assume further that the world price coincides with p^0p^0. This means that the wage at which labor-demand coincides with L^0 when the economy is open is the same as that under autarky, w^0.

Let us now ask how the wage rate changes along the demand curve at a larger quantity of labor, say, L'. Assume that L' is sufficiently close to L^0 that, holding the goods-price constant, the economy remains fully diversified. We already know from Figure 1 that, in this case, if the economy is open and small, the wage compatible with L' is unchanged; the demand is perfectly elastic over the range L^0L'.

But what if the economy is closed? In view of the Rybczynski theorem, at the initial autarky price, the production point moves from A^0 to A^1. If both goods exhibit positive income elasticities of demand, the consumption equilibrium lies to the southeast of A^0, say, A^2 along the production frontier E'F' defined by endowment (S^0, L'). This implies a higher relative price of good 1 and, via the Stolper-Samuelson theorem, a lower wage. The labor-demand curve is downward sloped and, thus, less then perfectly elastic. This gives us the case drawn by Leamer.

But, in general, there is no reason for preference to exhibit positive income elasticities of demand for all goods. And, once we admit negative income elasticities, it is possible for the autarky equilibrium with endowments S^0 and L' to be at A^1 or even to the northwest of that point, say, A^3. If so, the relative price of good 1 under autarky is no higher than p^0 and the associated wage is no lower than w^0. The labor demand is either horizontal (as in the small, open-economy case) or *upward sloped* between L^0 and L'. Various qualitative possibilities under autarky are, thus, as

shown by A^0A^1, A^0A^2 and A^0A^3 in the lower panel of Figure 2. The higher elasticity under the assumption of a small, open economy is by no means guaranteed.

We may be inclined to drop the case of negative income elasticity as being special and unlikely and thus rescue the proposition that labor demand is more elastic in an open than closed economy. It can be shown, however, that once we admit more than two goods, the possibility of a locally perfectly elastic or upward-sloped labor demand curve can arise even when preferences are homothetic. With three or more goods and two factors, the output effects of an increase in the quantity of labor need not follow the Rybczynski pattern. This property, in turn, opens the possibility of a locally horizontal labor demand in a closed economy despite all income elasticities being positive.

But this is not all. Even confining ourselves to the two-good case and positive income elasticities for both products, the lower demand elasticity under autarky obtains only when the economy is assumed to be fully diversified. If we admit the possibility of complete specialization, labor demand can be more elastic in a closed economy. This is shown in Figure 3 where the labor-demand curve under autarky is superimposed on the labor-demand curve under the assumption that the economy is open and small. If the economy's endowment happens to coincide with L^0 or L', the labor demand is unambiguously more elastic under autarky than under free trade. The reason is that at endowment L^0 (or L') and the given world price, the economy is completely specialized. A given increase in the demand for labor must be accommodated entirely by the expansion of the industry in which the economy specializes. When the economy is closed, however, both goods are produced, making it possible for the larger quantity of labor to be absorbed with a smaller reduction in the wage.

Again, one may be inclined to dismiss this case as special. But complete specialization by small, open economies is clearly a serious possibility. Indeed, in his formal analysis in the Appendix, Rodrik (1997) himself assumes that his small economy is completely specialized in the production of the export good. If he were to allow for diversification in production, as we will see later, the labor demand in his model will be perfectly elastic with as well as without capital mobility.

The Specific-Factors Model

In the specific-factors model, we can obtain a more elastic demand for labor under autarky than free trade even with two goods, full diversification and positive income elasticities of demand everywhere. Before I demonstrate this, however, we must make explicit an index-number problem, which we were able to side step in the two-factor model.

Recall that, if we define the labor demand as the relationship between the wage and the quantity of labor demanded *at constant goods prices*, the labor demand does not depend on whether the economy is open or closed. To make sense of the labor-demand construct applied by Leamer (1995), Wood (1995) and Rodrik (1997), in the previous section, we defined the labor-demand curve under autarky in such a way that it takes into account the adjustment in the goods-price ratio necessary to clear the goods markets. Thus, each point along the autarky labor-demand curve in Figure 3 is associated with a different goods-price ratio.

But the real wage along the vertical axis itself depends on the goods price ratio. If the real wage is defined in terms of both goods, each time goods prices change, we will have to re-scale the vertical axis. This obviously makes the demand curve meaningless. The way we get around this problem is by measuring the goods price and the wage both in terms of a common numeraire. In the two-factor, two-good model, this is not a serious problem since, for a price change, the wage either

rises or falls in terms of both goods. But in the specific factors model, we are faced with what is called the neoclassical ambiguity: the wage falls in terms of the good whose price rises but rises it in terms of the other good. With changing prices, whether the real wage rises or falls depends on the pattern of expenditure.

To get around this problem, let us initially assume that workers spend all their income on the numeraire good. We will return to the general case later. Suppose the economy consists of two sectors, with each sector using a specific factor. Unskilled labor is common to both sectors. Holding the quantities of specific factors fixed, it is entirely possible for a larger quantity of labor to leave the ratio of outputs of the two goods unchanged. That is to say, in terms of Figure 2, at a given price, output may expand along ray OA^0 (not shown). If preferences are homothetic, the price under autarky will be entirely unchanged and, hence, there will be no difference between the elasticities of demand for labor for closed and small, open economies. In this special case, even the issue of numeraire is moot; no matter what the expenditure patterns, the labor-demand elasticity is the same under autarky as when the economy is open and small.

Figure 4 offers detailed possibilities, assuming homothetic tastes. Under free trade and the small-country assumption, the labor-demand curve is obtained by summing the value-of-marginal-product curves of labor in the two sectors. This curve is negatively sloped as shown by $D_L{}^T D_L{}^T$. Suppose, at L^0, the autarky price coincides with the free-trade price, p^0. Consider then a higher level of L, L'. Holding $p = p^0$, the wage on the demand curve is w'. Under autarky, the price may change, however. If, at $p = p^0$, L' is associated with a higher proportion of good 1 to good 2 than L^0, p falls and if the opposite is true, it rises. In the former case, the wage in terms of the numeraire good falls below w' while in the latter case, it rises above w'. In the former case, the labor-demand

curve is less elastic than the one under free trade as shown by $D_L^A D_L^A$ while, in the latter case, it is more elastic as shown by $D_L^{A'} D_L^{A'}$. We do not obtain a unique relationship between openness and the elasticity of demand for labor.[7]

Though Figure 4 assumes that workers spend all their incomes on the numeraire good, the message conveyed by it can be validated in a more general model. Thus, for example, suppose the price index is $p_1^b p_2^{1-b}$ so that the real wage can be written $w/(p_1^b p_2^{1-b})$. Letting good 2 be the numeraire, this wage boils down to w/p_1^b. The question we now ask is whether, for a small exogenous increase in the labor demand, w/p_1^b falls more or less in a closed economy than in a small, open economy.

Let $R(p_1, 1, L, K_1, K_2)$ be the revenue function where K_1 and K_2 are factors specific to sectors 1 and 2, respectively. By the envelope property of the revenue function, the wage in terms of good 2 is given by

(3) $\quad w = R_L(.)$

where $R_L(.)$ is the partial derivative of R(.) with respect to labor. Differentiating (1) totally, we obtain

(4) $\quad \hat{w} = w_1 \hat{p}_1 + w_L \hat{L}$

where a hat (^) over a variable indicates the percentage change in that variable, w_1 is the elasticity of the wage rate with respect to the price of good 1 and w_L the elasticity with respect to labor. In the specific-factors model, w_1 is positive and less than unity and w_L is negative. The change in the real

[7]In the specific-factors model, when goods prices change, we are also faced with a numeraire problem. The wage falls in terms of the good whose price rises and rises in terms of the other good. This problem makes even the representation of labor demand with goods prices varying along it questionable. In Figure 3, we have essentially ignored this problem by opting for good 2 as the sole numeraire good.

wage can now be written

(5) $\hat{w} - b\ \hat{p}_I = (w_1 - b)\ \hat{p}_I + w_L\ \hat{L}$

In a small, open economy, the goods price does not change and the elasticity of demand for labor is $-1/w_L$. In a closed economy, the elasticity will be larger or smaller as the first term in (5) makes positive or negative contribution. In general, there is no presumption that the contribution of the first term will be negative, however.

2.2 Capital Mobility and the Elasticity of demand for Labor

In discussing the implications of capital mobility in the context of the wage debate, we are confronted with the issue of whether we can still maintain the assumption of two factors or we must switch to a three-factor model. If the objective is to focus on wage *inequality*, i.e., the unskilled-to-skilled-wage ratio, as done by a large body of the recent literature, there is little choice but to switch to a three-factor model. But if the objective is to focus exclusively on unskilled wages, one can still push forward with the two-factor model, replacing skilled labor in the previous model by capital. Though this route has some limitations to be discussed later, since it is the one followed by Rodrik, I consider it first.

Assume that there are two factors called labor and capital and denoted L and K, respectively. Consider first the implications of capital mobility alone, assuming that the country does not trade in goods.[8] Make the small-country assumption so that capital flows freely in and out of the country at a given rental rate. We must now define the labor-demand curve such that the stock of capital varies endogenously along it. Assume that, at the initial factor endowments, L^0 and K^0, the rental rate

[8] The discussion in this section does not pay explicit attention to the external-balance condition. But this can be done, following Mundell's (1957) treatment in his classic work.

under autarky, r^0, coincides with the world rental rate. Given r^0, equations (1a) and (1b) can be solved for p^0 and w^0. This yields (L^0, w^0) as a point on the labor demand curve.

Consider next a larger quantity of labor, L', when capital is mobile internationally. At the original goods price, the wage rate corresponding to it on the labor demand curve is w^0 with more of good 2 and less of good 1 produced. The goods market may not clear at these outputs and prices, however. For example, with the relative supply of good 1 declining, under homothetic tastes, there is an upward pressure on the relative price of good 1. This, in turn, puts upward pressure on the rental rate, attracting foreign capital. The additional capital expands sector 1 and contracts sector 2, thus, reducing the upward pressure on the price of good 1 as also the rental rate. The inflow must continue until a new equilibrium is reached at which w^0, r^0 and p^0 are restored. The ratio of quantities consumed, after netting out the payment for foreign capital, is also restored to its original level. The new point on the labor-demand curve is (L', w^0) indicating an infinitely elastic labor demand curve between L^0 and L'.[9] The key difference with the free-goods-trade case is that, in the present case, we do not get complete specialization so that the labor-demand curve is perfectly elastic everywhere.

In the absence of capital mobility and goods trade, we have already seen that strictly positive income elasticities for both goods will lead to a downward-sloped labor-demand curve along which the goods price (rather than the quantity of capital) adjusts endogenously. But if negative income elasticities are admitted, the downward slope is not guaranteed. Alternatively, even with positive income elasticities of demand everywhere, if there are three or more goods, labor demand can be locally horizontal or even upward sloped. Thus, by itself, capital mobility does not necessarily

[9]This is, of course, due to substitutability between trade and factor mobility noted by Mundell

imply a more elastic labor-demand curve either.

What happens if we compare the case of perfect capital mobility with no mobility at a free-trade equilibrium? If it is assumed that the conditions for factor-price equalization under free trade between our country and the rest of the world are satisfied for all labor quantities under consideration, the presence of capital mobility will do nothing to the demand for labor: it will be perfectly elastic both with and without capital mobility.

For capital mobility to make a difference, it must be assumed that free trade by itself is insufficient to yield factor-price equalization. Though there are many possibilities, two of them are especially worth considering. (i) We may assume, as done by Rodrik, that the economy is completely specialized in the production of one of the two goods. (ii) We may assume that technologies of production differ so that in spite of a diversified production structure, goods-price equalization is insufficient to lead to factor price equalization.

(i) Complete Specialization: The Rodrik Case

As in Rodrik (1997, Appendix A), assume that the economy is completely specialized in the capital intensive good which it exports. With p^0 given from the world market and $K = K^0$, equation (2) for i = 1 (after replacing S by K) gives us the demand for unskilled labor in the absence of capital mobility. This is an inverse relationship between w and L as shown by curve $D_L{}^T D_L{}^T$ in Figure 5.

Under capital mobility, suppose the rental rate in the outside world is r^0. Given $K = K^0$ and $r = r^0$, we can solve (1a) and (2) for i = 1 (after substituting r for s and K for S) for w and L. For ease of comparison, assume that the solution, $(w^0\ L^0)$, lies on $D_L{}^T D_L{}^T$ in Figure 5 and is represented by point Q^0. If we now consider a larger quantity of L, say L', in the absence of capital mobility, the

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(1957).

associated rental rate is higher than r^0. This, in turn, attracts foreign capital. The flow continues until the labor-to-capital ratio is restored to L^0/K^0, with the result that the wage rate also achieves its original level of w^0. We have an infinitely elastic labor demand curve.

(ii) Diversification: An Alternative Case

Assuming free trade, this higher elasticity of the labor-demand curve under capital mobility is not inevitable, however. If we modify the model so as to allow diversification in production, the labor-demand curve becomes perfectly elastic even in the absence of capital mobility. Thus, allow for differences in technology between the home country and the outside world. To be concrete, assume that technology in sector 1 in the country is superior, say, in the Hicks-neutral sense, while that in sector 2 is the same as in the outside world. At the given world price, this will establish a higher rental on capital and lower wage at home than abroad. As already explained with the help of Figure 1, even in the absence of capital mobility, the demand for labor curve in this situation is infinitely elastic for labor quantities within the diversification cone defined by the given factor prices. Only outside this range, complete specialization in one of the products results in the demand curve sloping downward.

If capital is mobile internationally, since the rental rate is higher in the home country, it flows into the latter. But, with the goods price given from the world market, the rental rate remains unchanged as long as the economy is diversified. Therefore, capital continues to flow into the country until it is completely specialized in the production of good 1. Once complete specialization obtains, we can apply the analysis of the previous (Rodrik's) case: we obtain an infinitely elastic demand for labor. But as shown in the previous paragraph, this shape also obtains over the range defined by the relevant diversification cone in the absence of capital mobility.

The thesis that capital mobility necessarily leads to a more elastic labor demand curve is therefore invalid in the two-factor model. However, I have noted earlier that the implications of capital mobility for changes in *wage inequality*, as contrasted with the *level* of unskilled wage simply cannot be addressed in a two-factor model on which Rodrik relies: a three-factor model with skilled and unskilled labor and capital must be used. Taking the goods prices as given in the world market as Rodrik (1997) does and assuming two goods, there is no guarantee in such a model that capital mobility will make labor demand more elastic. With three factors, it is possible for factors to exhibit complementarity, which can lead to unexpected results. An inflow of capital in this model can raise or lower the unskilled wage, making the effect of such inflow on the elasticity of labor demand ambiguous in general.

3. Openness and Wage Outcomes

The key conclusion I draw from the analysis in the previous section is that we cannot accept as compelling the results based on the assumption that the labor-demand curve is more elastic when the economy is open than when it is closed. To evaluate the implications of openness for wage outcomes, we cannot rely on a reduced-form construct whose microeconomic foundations have now been shown to be questionable. Instead, we must work directly with the underlying model as was done by Bhagwati and Hamada (1974) in their original analysis of some of these issues.

The broader question addressed by Rodrik was formulated by Deardorff and Hakura (1994) as follows: "How do wages respond differently to changes in economic conditions at home when international trade is allowed to change too, as compared with being held constant?" Rodrik answers this question with respect to the incidence of a higher labor standard, the impact of increased volatility and the impact on the bargaining power of workers, focusing on the extreme

cases of free trade and autarky.

To recapitulate, Rodrik offers three results relating to wage outcomes:

(i) The more open an economy, the greater the reduction in the wage received by workers as a result of the introduction of a higher labor standard.

(ii) The more open an economy, the greater the volatility in both earnings and hours worked resulting from shocks to labor demand.

(iii) The greater the openness, the less the bargaining power of workers and, hence, the lower the wages of workers.

Let us consider each of these in turn in the 2x2 and specific-factors model.

3.1 The 2x2 Model

Incidence

Let us revert back to our original labeling so that unskilled and skilled labor are the two factors with 1 being skilled-labor intensive. A key claim of Rodrik (1997, pp. 17-19) is that workers bear a higher incidence of the cost introduced by a higher safety standard in a sector in an open economy relative to that in a closed economy. Following Harberger's (1962) seminal analysis, this conclusion is readily examined using the 2x2 model, without having to worry about the elasticity of demand for unskilled labor.

Consider first the small-open-economy case. In Figure 6, we depict the unit-cost pricing conditions introduced in equations (1a) and (1b). The curve labeled $c_1(s, w) = p^0$ shows various combinations of s and w that yield a cost of p^0 when resources are efficiently employed in sector 1. The slope of the curve at a point represents the optimal skilled-to-unskilled-labor ratio at the factor-

price combination shown by that point. A similar interpretation applies to curve $c_2(s, w) = 1$. Because good 1 is skilled-labor intensive and we measure w on the horizontal axis, the unit-cost curve associated with this good cuts the unit-cost curve for good 2 from below. Assuming both goods are produced, the average-cost pricing conditions should hold simultaneously for both goods which, in turn, yields E^0 as the equilibrium factor-price point.

Suppose now that we introduce a higher safety standard in the labor-intensive sector. Assuming the cost to be a proportion t of the wage rate, this change shifts the unit-cost curve associated with good 2 horizontally to the left by t.w. The wage paid by the firm must now include the cost of the safety standard, leaving a lower net wage payable to workers. The shifted curve is shown by $c_2(s, (1+t)w) = 1$ in Figure 6. At the new intersection, the unskilled wage declines and skilled wage rises. Intuitively, at constant goods prices, a tax on unskilled labor through a higher safety standard in the unskilled-labor-intensive sector causes that sector to shrink. Since sector 1 uses less unskilled labor per unit of skilled labor, at the original factor prices, this creates an excess supply of labor and forces the wage to fall.

The higher safety standard leads to a decline in the relative supply of the unskilled-labor-intensive good, good 2, and income. In a small, open economy, these changes are accommodated through trade without any change in the relative good price. In a closed economy, assuming preferences to be homothetic for now, these changes generate an upward pressure on the relative price of good 2. This increase in the price leads to a partial reversal of the decline in the unskilled wage, yielding Rodrik's result that a higher safety standard leads to a smaller decline in the wage in a closed economy.

But this is not an inevitable outcome. If preferences are nonhomothetic such that the decline

in real income is accompanied by a sufficiently large decrease in the demand for good 2, in a closed economy, the relative price of good 2 could actually fall. In this case, the wage decline will be larger than in an open economy, reversing Rodrik's result.

But even this is only half of the story since so far we have focused on the introduction of a higher safety standard in the unskilled-labor-intensive sector. Suppose, instead, the higher standard is introduced in the skilled-labor-intensive sector. In this case, it is the unit-cost curve of good 1 in Figure 6 that shifts to the left, leading to a *rise* in the unskilled wage at constant goods prices. Intuitively, the higher standard causes the unskilled-labor-intensive good to expand which, in turn, increases the demand for unskilled labor and raises its return.

In a small, open economy, the story ends here. But in a closed economy, assuming homothetic tastes, the expansion of the unskilled-labor-intensive good lowers the price of unskilled-labor-intensive good and reverses partially the wage increase. As such, the net increase in wage is larger in an open than in a closed economy. In this case, openness works to the advantage of workers.

Finally, suppose that the safety standard is introduced in both sectors. Given our assumption that the cost of the standard is a constant proportion of the wage rate, at the initial prices, this change has no effect on the relative outputs of the two goods.[10] Therefore, if preferences are homothetic, the autarky price is unchanged. The incidence of the standard on the workers is the same in a closed and a small, open economy. If tastes are nonhomothetic such that the reduction in income lowers the relative demand for the skilled-labor-intensive good, the introduction of the safety standard raises the

[10]Intuitively, the standard works like a proportional tax at the same rate on labor use in both sectors. Given fixed labor supply, such a tax works like a lump sum tax and has no effect on the allocation of labor between the two sectors.

relative price of the unskilled-labor-intensive good under autarky and, thus, reverses partially the wage decline. We have the opposite of Rodrik's result. If nonhomotheticity works in the opposite direction, lowering the price of the labor-intensive good under autarky, we get Rodrik's result.

Volatility

Rodrik (1997, 19-23) also uses the assumption of a higher elasticity of labor demand to argue that openness leads to a greater volatility in labor's earnings. It is easy to show that there is no compelling case for this result either. To give a dramatic example, suppose that the domestic demand shifts so as to lower the demand for the unskilled-labor-intensive good. This change lowers the price of the unskilled-labor-intensive good more in a closed than in a large, open economy and has no effect at all in a small, open economy. It follows that the unskilled wage declines more in a closed than in a large, open economy and remains entirely unchanged in a small, open economy. Contrary to Rodrik's conclusion, we have greater volatility in the unskilled wage in a closed than an open economy.

Next consider the shock analyzed by Rodrik: a shift in productivity. In terms of a construction similar to Figure 6, a Hicks-neutral technical progress in, say, sector 1 shifts the unit-cost curve of that sector radially out, causing the unskilled wage to decline at constant goods prices. In a small, open economy, the story will end there. But if the economy is closed, the change increases the supply of good 1 relative to good 2 and, given homothetic tastes, lowers the price of good 1. The reduction in the price, in turn, shifts the unit-cost curve of good 1 back in Figure 6. It can be shown that if the elasticity of substitution in demand happens to be unity, this reverse shift exactly offsets the initial shift due to the increase in productivity. We observe no change in the unskilled wage in terms of the numeraire and relative to the skilled wage. This result resembles

Rodrik's result.

If the elasticity of substitution is less than unity, however, the decline in the relative price of good 1 under autarky is sufficiently large to push the unit-cost curve of good 1 closer to the origin than before the technical change. In this case, the unskilled wage actually falls in terms of the numeraire and there is no guarantee in general that this fall is proportionately less than the rise in the wage in the small, open economy case.

These examples should make clear that Rodrik's conclusion that openness leads to a greater volatility in the earnings of workers is invalid in general. This should not be surprising, of course, since volatility depends on the source of instability, not just on the initial conditions or the structure of the economy.

Bargaining

Finally, Rodrik (1997, 23-25) argues that capital mobility has hurt the interests of unskilled workers by reducing their bargaining power. A full justice to assessing this argument will require a full-scale model in which the bargaining process is explicitly formulated. Since such an exercise is beyond the scope of this paper, I take recourse to a simple example from the existing international trade literature [Jones (1971), Magee (1971)]. Via this example, I demonstrate that even if we accept that openness leads to a decline in the bargaining power, it does not follow that the decline will necessarily lower unskilled wages.

Thus, consider Figure 7, which is similar to Figure 6. Suppose the economy is open to trade and small so that the goods prices are fixed. Suppose further that there is a union in the labor-intensive sector, which keeps the unskilled wage in that sector above that in sector 1. The skilled wage is the same across sectors. Skilled wage s^0 and unskilled wages w_1^0 and w_2^0 in sectors 1 and 2

illustrate these outcomes.

Suppose now that openness is accompanied by a decline in the workers' bargaining power in the labor-intensive sector. Such a decline will actually allow the labor-intensive industry to expand and hence unskilled wage to rise in general. Indeed, as is readily seen from Figure 7, as we reduce the gap between the wages in the two sectors, wages received by unskilled workers in both sectors rise.

3.2 The Specific-Factors Model

Incidence

To take the simplest case, suppose the autarky price coincides with the free-trade price. Then the initial equilibrium under autarky as well as free trade can be represented by the intersection of the value-of-marginal-product-of-labor (VMPL) curves in Figure 8. In this figure, O_1O_2 represents the total quantity of labor in the economy, L_1 is measured to the right from O_1 and L_2 to the left from O_2. The curve labeled V_1V_1 represents the VMPL in sector 1 and that labeled V_2V_2 the VMPL in sector 2.

A rise in the labor standard in sector 1 is represented by a downward shift in the V_1V_1 curve. The shift, in turn, lowers the wage received by workers in both sectors. In a small, open economy, this is the end of the story. But under autarky, there is further change due to the fact that the goods markets must be cleared endogenously. At E□, the output of good 1 has declined while that of good 2 has risen. Assuming homothetic preferences, these output changes lead to a rise in the price of good 1.

Does this rise in the price of good 1 raise the real wage or lower it? It is well known that the

specific factors model is characterized by the so-called neoclassical ambiguity: the wage falls in terms of the good experiencing the price increase and rises in terms of the other good. Unless we know more about the consumer's expenditure pattern, we cannot determine whether the real wage rises or falls due to the price increase. In particular, if the consumer spends a large proportion of his income on good 1 whose price rises, contrary to Rodrik's claim, the real wage falls more due to the rise in the labor standard under autarky than under free trade.

In fact, the prospects for Rodrik's position can be bleaker. So far, we have assumed that the initial price under autarky is the same as under free trade. This assumption is obviously unrealistic. Letting good 1 be the country's import good, under autarky, the price of good 1 will be higher than the free-trade price. This fact implies that the VMPL curve in sector 1 under autarky lies above the V_1V_1 curve in Figure 8. It is then entirely possible for even the initial decline in the wage due to the introduction of the higher labor standard, holding prices constant, to be smaller under free trade than under autarky.

A final point concerns the effect of an increase in the labor standard in both sectors. In this case, both V_1V_1 and V_2V_2 curves shift down equally In figure 7. If the initial prices are assumed to be the same under autarky and free trade and preferences are homothetic, the effect on the wage is the same under the two scenarios. If the initial prices differ, the percentage changes in the real wage are still the same if the labor standard is modeled as an ad valorem tax. Consequently, if the real wage is higher under autarky, the absolute decline in the wage is also higher under autarky than free trade!

Volatility

In view of the analysis in Figure 8, it should not be surprising that, as in the 2x2 model, the

implications of trade openness for volatility are also going to be ambiguous in the specific-factors model. As in the 2x2 case, suppose the shock is due to a shift in the domestic demand away from the import-competing good, say, good 1. Under free trade, making the small-country assumption, this change has no effect on the goods price ratio and hence the wage rate. In a closed economy, it raises the relative price of good 1 and does impact the real wage. We clearly have more volatility in earnings in the closed-economy setting.

Turning next to the shock considered by Rodrik, suppose the productivity in good 1 rises so as to increase the marginal product of labor at a give ratio of the specific factor and labor by 1%. In the small, open-economy context, the prices will be unchanged and the wage will rise by less than 1% in terms of both goods. Under autarky, the relative price of good 1 will fall and the wage could rise by more than 1% if measured in terms of that good. Again, there is no guarantee that earnings are more volatile under free trade.

Bargaining

The argument made by Rodrik is that a move from autarky to free trade lowers the real wage more in the presence of unionization than in its absence since trade leads to a reduction in the bargaining power of the union. To assess the argument, consider Figure 9. Suppose that in the presence of a labor union in sector 1, under autarky, the VMPL curves of sectors 1 and 2 are given by $V_1^U V_1^U$ and V_2V_2, respectively. The labor union under autarky holds the wage rate in sector 1 at $w_1^U = bw_2^U$, where $b > 1$. By assumption, opening to trade not only lowers the relative price of good 1 but also eliminates the labor union thereby yielding a single equilibrium wage w_0^T. The wage changes from w_1^U in sector 1 and w_2^U in sector 2 to w_0^T in both sectors.

The question we ask is how these changes compare to the changes in the absence of the

union. With no union, under autarky, the output of good 1 will be larger and, with homothetic demand, the price of good 1 lower. That is to say, the VMPL curve in sector 1 will lie below that shown by $V_1^U V_1^U$. The unified wage in terms of the numeraire will be below w_0 but above w_2^A, say, w_0^A.

Measuring the wage in terms of the numeraire, a movement from autarky to free trade leads to a larger decline in the wage in sector 1 and a smaller decline in it in sector 2 in the presence of the union than in its absence. In sector 1, the wage decline from w_1^U rather than w_0^A in the presence of the union; in sector 2, it declines from w_2^U rather than w_0^A. If the proportion of the labor force belonging to the unionized sector is small as is true in the United States, on average, there is no guarantee that the overall wage decline is larger in the presence of a union than in its absence.

4. Concluding Remarks

In this paper, I have shown that the Leamer-Rodrik-Wood assertion that the demand-for-labor curve is more elastic in an open than a closed economy is not valid in general. The statement is violated in both the 2x2 and specific-factors models. Furthermore, many of the results obtained by Rodrik (1997) assuming the statement to be true fail to hold (as logically true, as distinct from being possible outcomes) when we spell out the full structure of the model.

Thus, within two most popular models of trade--the 2x2 and specific-factors models--, there is no guarantee that openness leads to a greater incidence of higher labor standards being borne by workers or to greater volatility in wage earnings as a consequence of shocks to the economy. It is also not true in general that when openness leads to reduced bargaining power, it contributes negatively to wages. In the 2x2 model, exactly the opposite may happen.

Rodrik's analysis focuses on the implications of openness, especially factor mobility, for the

response of wages to changes in policy or other exogenous variables. A larger question concerns the contribution of the mobility of capital and immobility of labor to the *level* of unskilled wages. Here it stands to reason that if anything, free mobility of capital and immobility of unskilled labor must have helped the wages of the unskilled in the United States. During 1980s, the United States has been a large recipient of foreign capital. The presumption is that this must have contributed favorably to both skilled and unskilled wages. Similarly, if unskilled labor had been mobile, the United States would have been an importer (over and above the illegal immigration that did take place) of them. This, too, would have hurt unskilled workers. The key determinant of the *level* of wage is not the degree of factor mobility but its direction.

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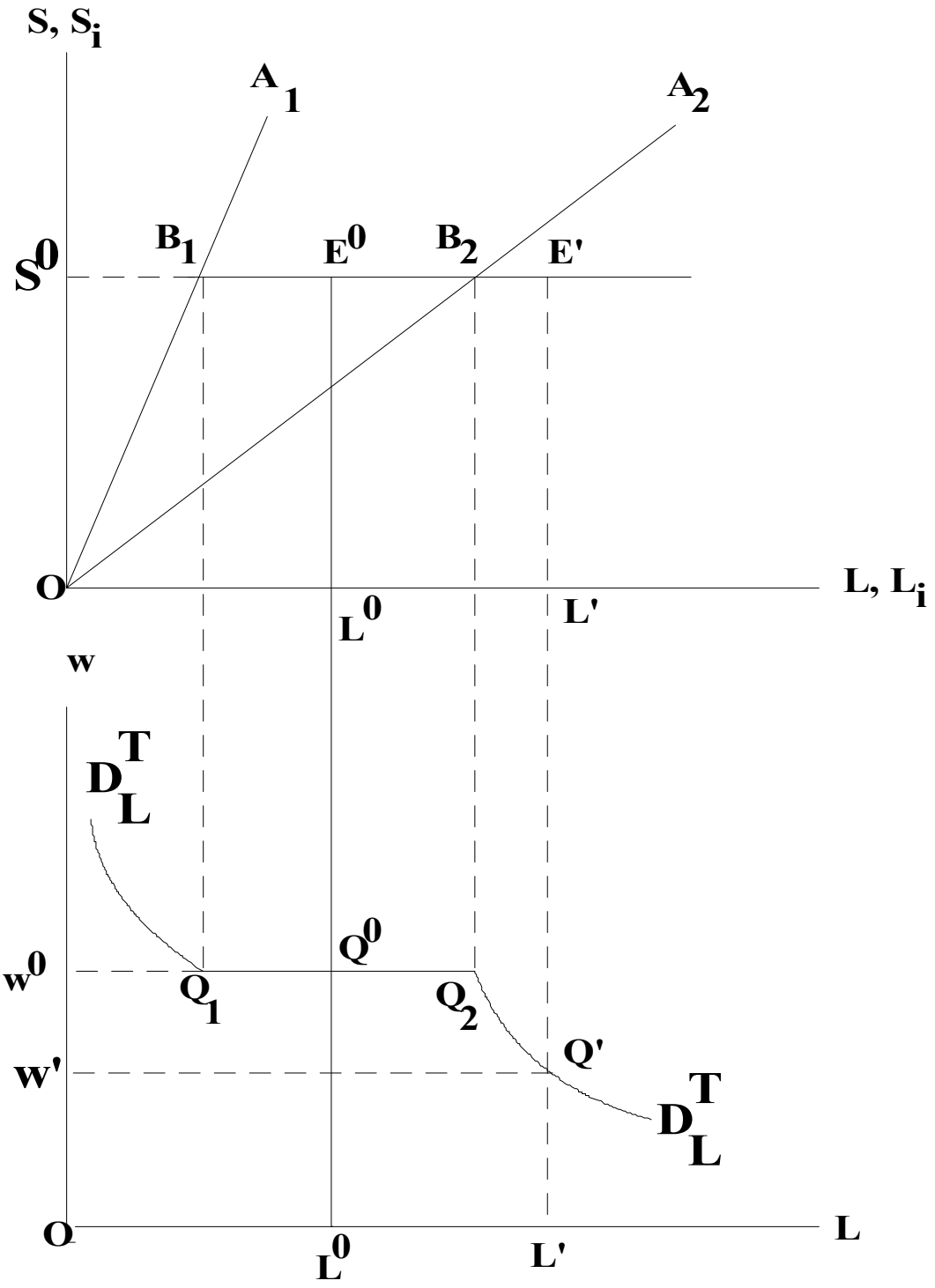

Figure 1: Labor Demand in a Small, Open Economy in the 2x2 Model (Goods Price Ratio and S are Fixed)

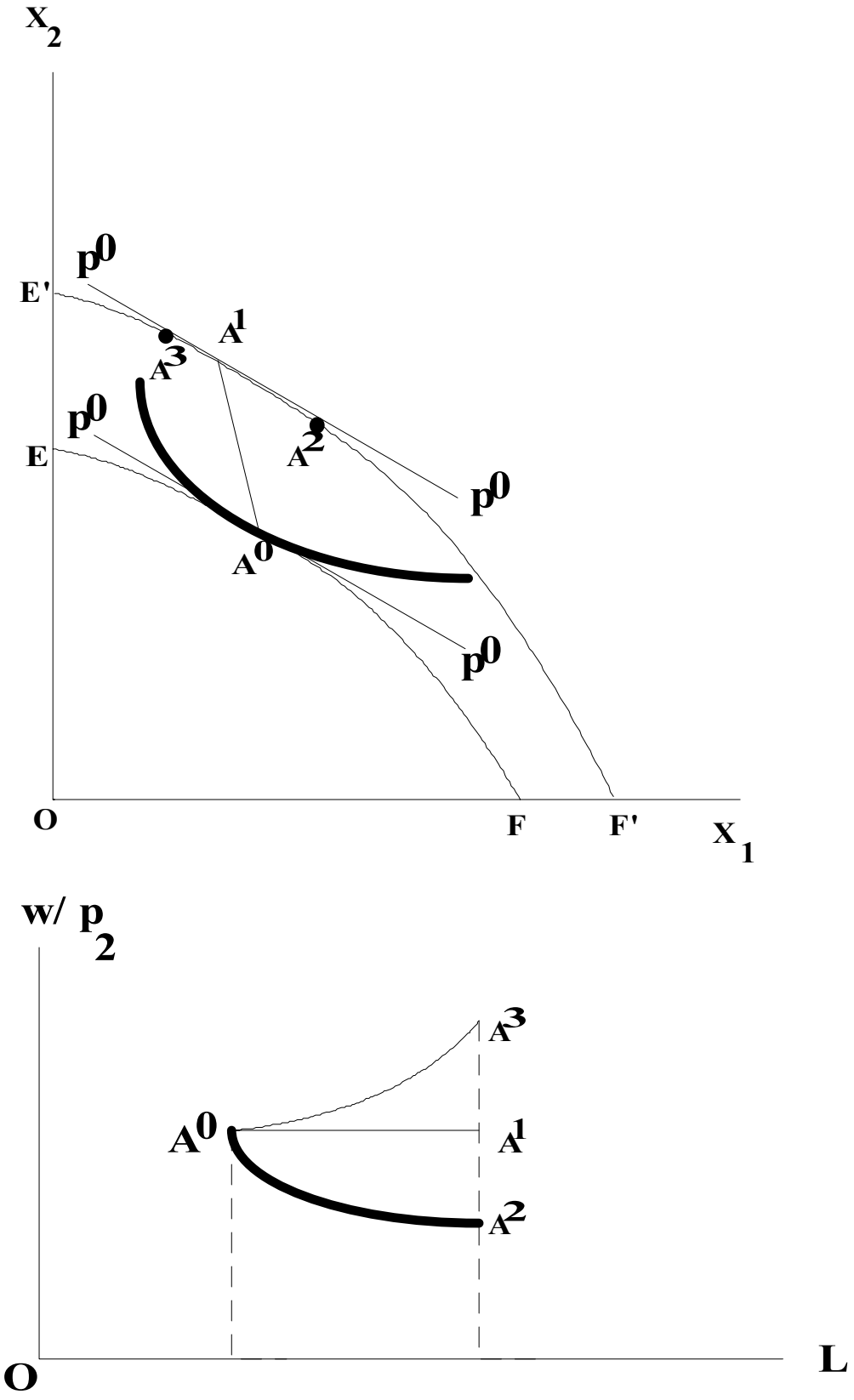

Figure 2: Labor Demand under Autarky in the 2x2 Model

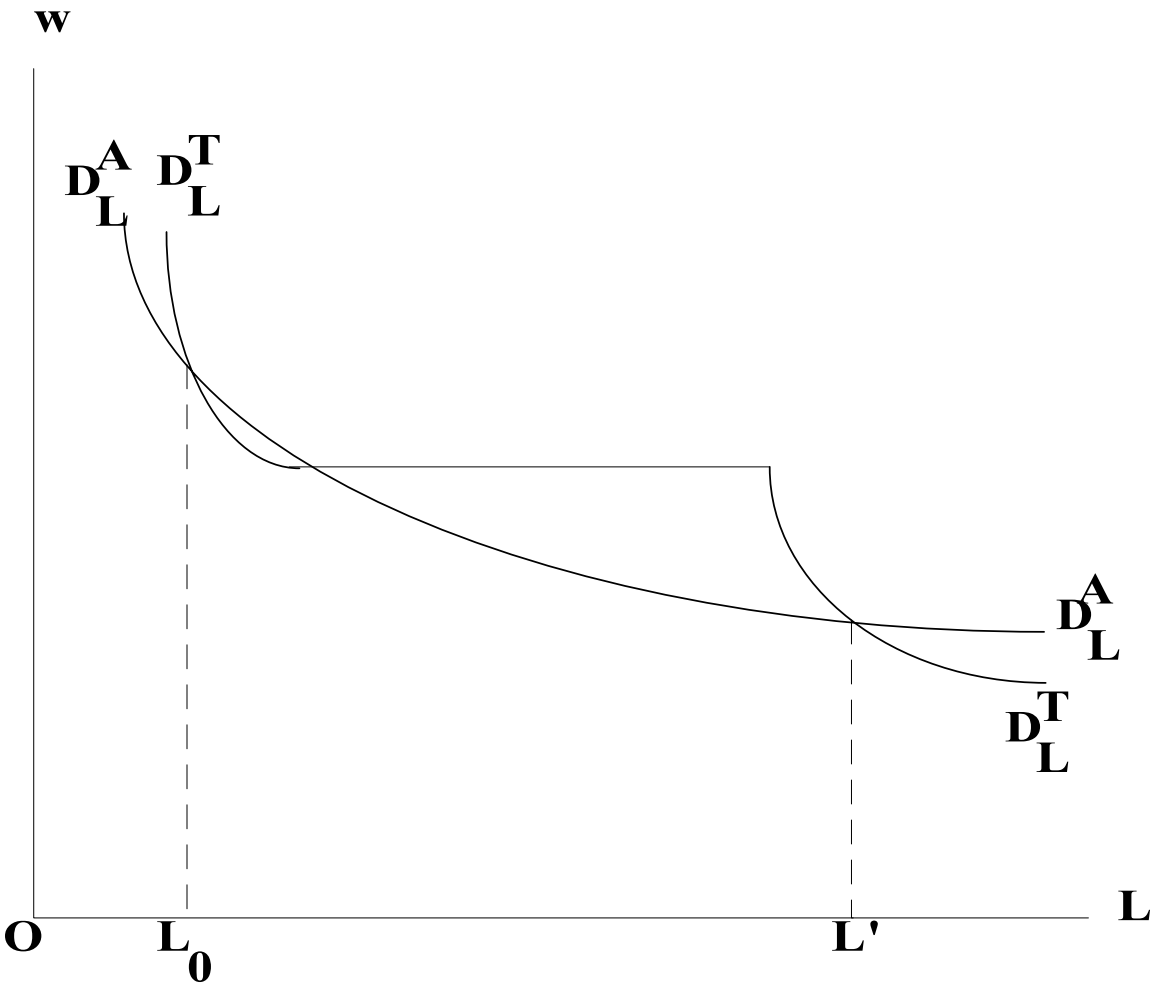

Figure 3: The Autarky Demand Curve is More Elastic at Wage Rates Other Than the One Along the Horizontal Section of the Free Trade Demand Curve

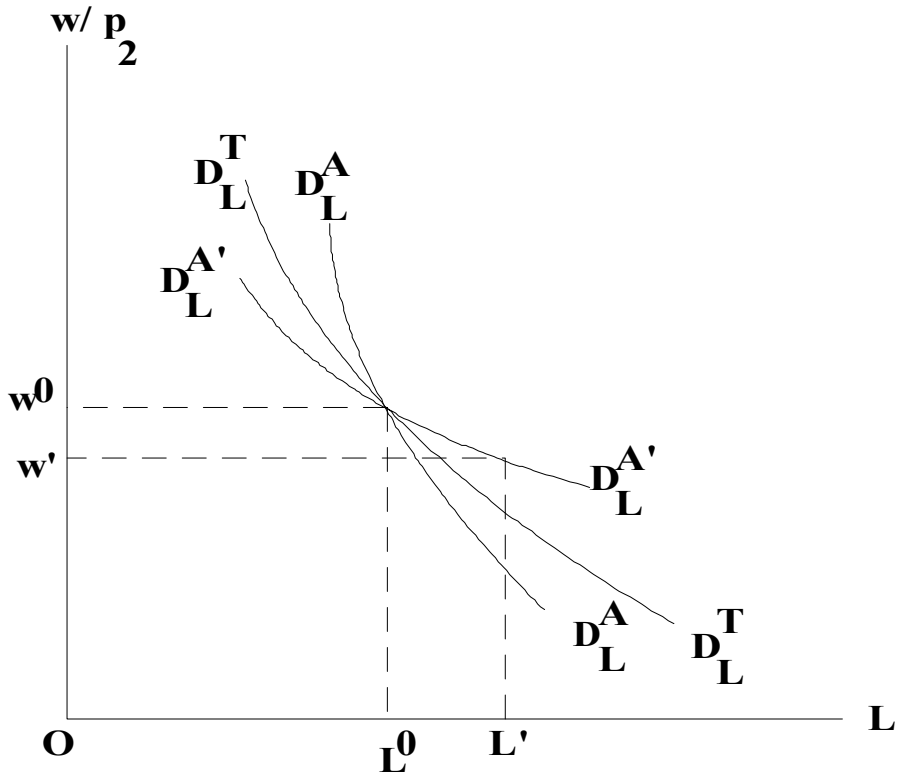

Figure 4: Labor Demand in the Specific-Factors Model under Ftee Trade and Autarky

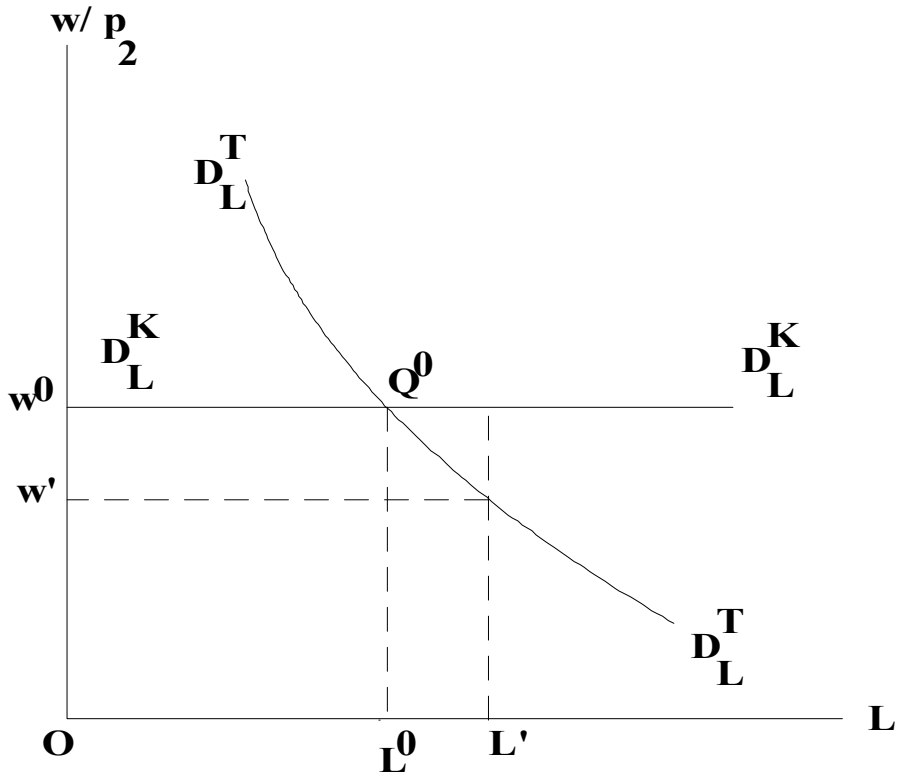

Figure 5: Labor Demand in a 2x2, Small, Open Economy under Complete Specialization with and without Capital Mobility (The Rodrik Case)

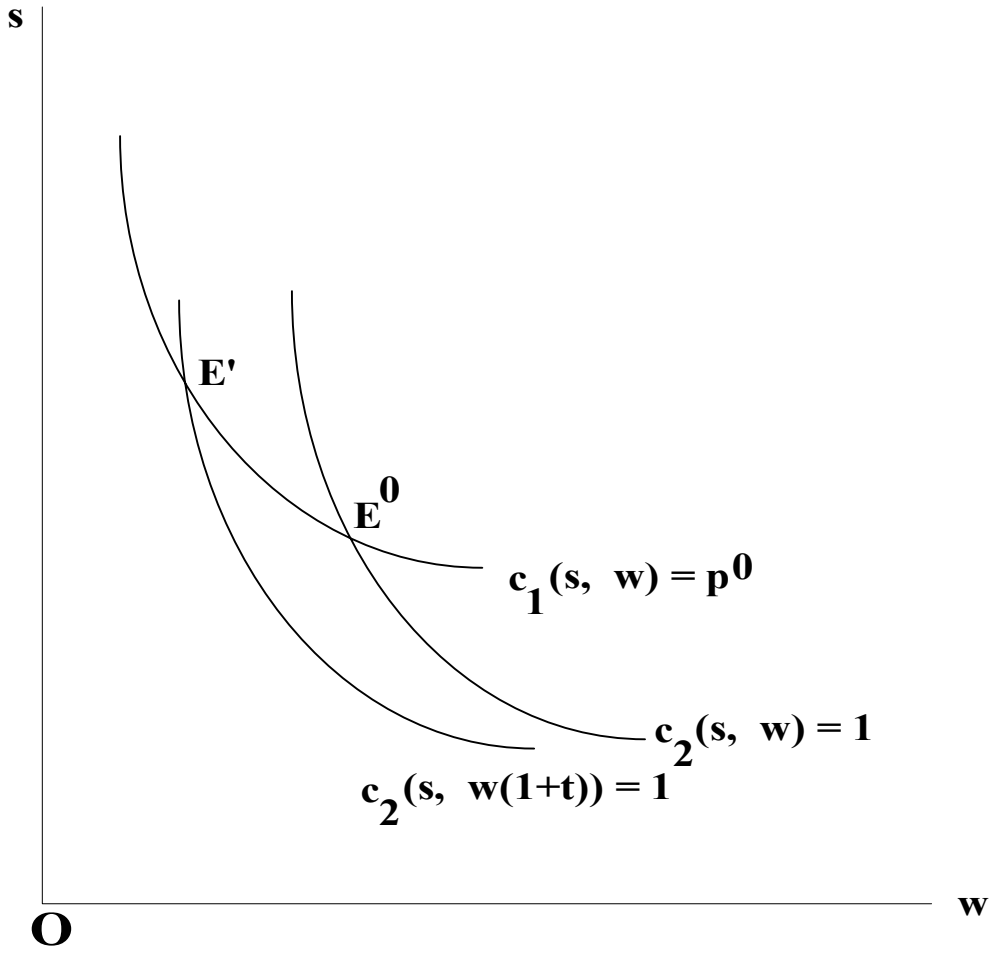

Figure 6: The Effect of the Introduction of a Safety standard in the Labor Intensive Sector

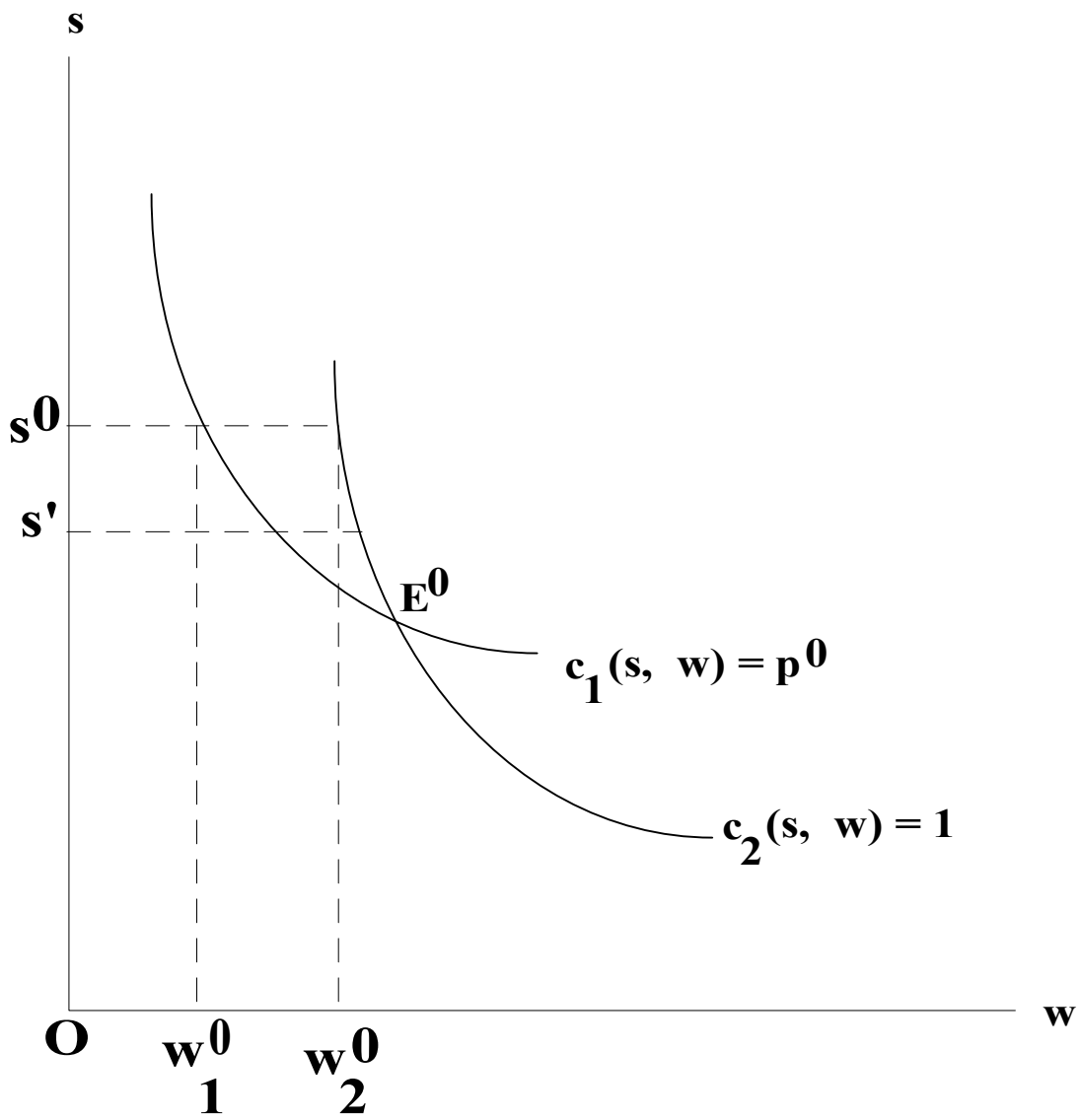

Figure 7: The Effect of a Reduction in the Wage Premium in the Labor Intensive Sector om Wages

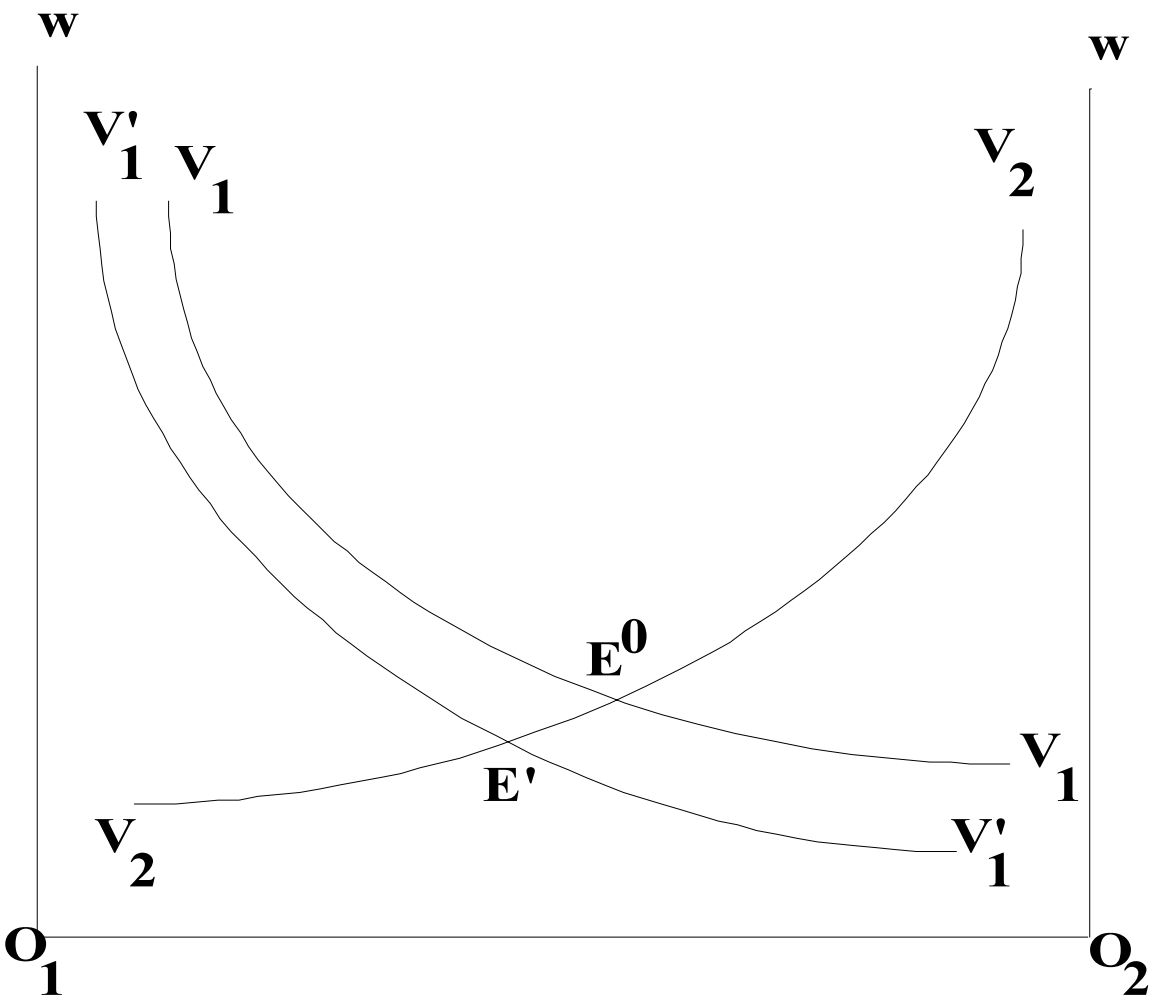

Figure 8: The Incidence Issue in the Specific-Factors Model

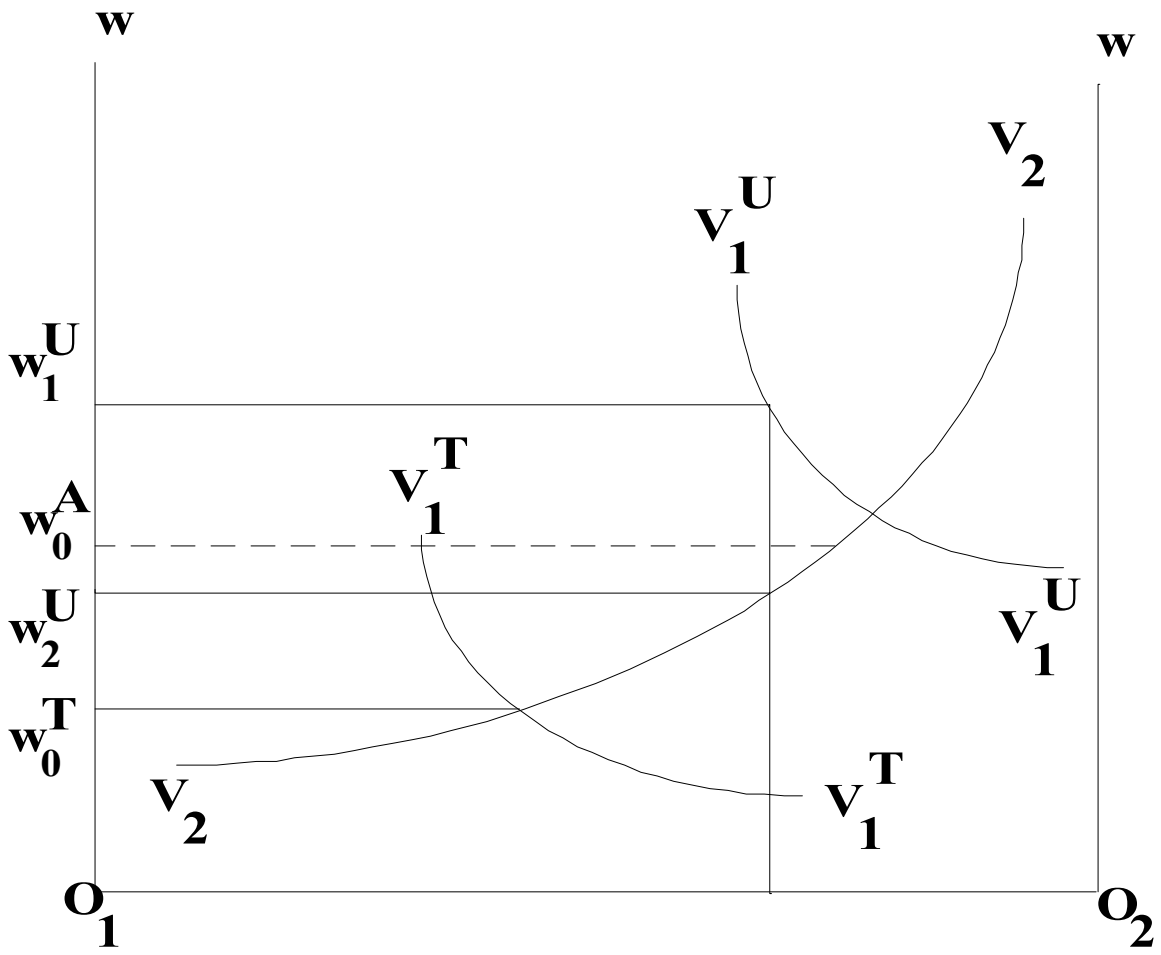

Figure 9: Bargaining and the Specific-Factors Model