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ABSTRACT

This paper explains the differential impacts of trade on countries in terms of institutional differences which result in factor market distortions. We modify the Ricardian, Specific Factor and Hecksher Ohlin models of trade to capture these. Trade has both terms of trade effects and output effects. Both work to raise welfare in an undistorted economy. In a distorted economy, price effects work to improve welfare, while output effects work to reduce it. Large distorted countries are more likely to lose from trade as beneficial price effects are lower. In addition the greater the substitutability between goods, the more likely it is that welfare rises through trade.

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1 Introduction

The latter part of the 20th century saw a surge in trade volumes. Some developing countries liberalized trade hoping to emulate the success of the East Asian miracle economies; others just out of the socialist bloc looked to the world for consumer goods. Most did not perform very well. During the early stages of liberalization, incomes even fell in many transition economies. It would seem appropriate to ask what might lead to such different experiences with trade liberalization.

We argue that labor market distortions and their interactions with trade liberalization might be important in answering this question. This paper is related to the literature in trade on factor market distortions, work in Labor Economics on heterogenous labor as well as to work in Development Economics on organizational differences between developing and developed economies.

While factor market distortions and their effect in open economies have been a focus of much work in trade, attention has been targeted for the most part on the effects of minimum wages. See for example, the work of Brecher (1974a,b) (which looks at the effect of a minimum wage distortion on an open economy) as well as the recent work of Davis (1998) (which looks at the effects of trade between an economy with a minimum wage distortion (Europe) and one without it (the U.S.) and argues that trade may simultaneously prop up U.S. wages and cause greater unemployment in Europe). The minimum wage distortion in these studies is exogenously specified. Brecher (1992) develops an efficiency wage model with an endogenous factor market distortion which results in unemployment. The endogenous distortion in our model result in resource misallocations, not in unemployment.[1]

[1] See Rodrik (1987) for some other examples of endogenous distortions and the importance of modelling them in terms of structural parameters.

If firms are unable to identify the ability of workers and workers are unable to fully signal their ability then wages are positively related to the average ability of the labor pool firms draw from. For example, Weiss (1980) develops such a model in a partial equilibrium closed economy setting and argues that job queues or unemployment could occur. Although our model has some common features with these models, we have a general equilibrium model in an open-economy setting.

There is also a large literature in Development Economics on the effects of family farms. However, most of this work deals with homogeneous labor in a closed economy setting. Family farming results in workers earning the average rather than the marginal product in agriculture. When workers are identical in ability and marginal product is diminishing, as has been assumed in this literature, average product exceeds marginal product so that too many workers remain in agriculture. In the development literature this distortion has been linked with the concept of "Disguised Unemployment", see Sen (1960). However, when labor varies in ability, as in our model, only lower ability labor remains in agriculture. The marginal worker obtains a wage below his marginal value product. As a result too few workers remain in agriculture rather than too many!

Differences in the way labor markets work crucially affect how production is organized in various economies. In market economies, workers are paid the value of their marginal product so that labor allocation between sectors is efficient. Such economies can only gain from trade. On the other hand, institutional constraints may prevent an efficient allocation of labor. In this paper we look at a particular kind of factor market distortion that can be interpreted in both the context of an economy making the transition from a socialist to a market economy, or in terms of institutions existing in parts of the developing world.

In the former socialist economies (transition economies), the state owned sectors (the distorted sector) usually pay a flat wage per worker which is only loosely related to ability. If other sectors are undistorted and pay a productivity based wage, the best workers are attracted to the undistorted sector while the lower ability ones flock to the distorted sector. In developing economies, agriculture is run along family farm lines so that workers in agriculture (the distorted sector) can be thought of as obtaining a fixed wage rather than the value of their marginal product. When workers differ in their abilities, this leads to higher ability workers leaving agriculture.

With either interpretation, the effect of the distortion is the same. In autarky, too little of the distorted good is made and its price is too high. As a result, the distorted economy has a comparative disadvantage in the distorted good which is imported when the economy is opened up. This reduces the output of the distorted good and worsens the distortion. On the other hand, trade results in the usual price effects which raise welfare. Thus, welfare may rise or fall as a result of trade liberalization. However, a large distorted economy always loses from trade as it does not reap any beneficial price effects. This is in line with the literature on the theory of the second best, (see Lipsey and Lancaster (1956)) where a recurring theme is that in the presence of existing distortions, reduction or removal of a distortion can lower welfare. See, for example (Ethier 1982).

In autarky, the effect of the distortion on welfare depends on the extent of substitutability in consumption. If the goods are perfect complements, in autarky the consumption levels are the same as in an undistorted economy. However if there is any substitutability, there is too little output in the distorted sector. The more the substitutability, the greater the deleterious effects of the distortion; since the price of the distorted good is higher than in an undistorted

economy, consumers substitute away from it a lot when substitutability is high, causing far too little of the distorted good to be produced (as compared to the efficient level).

Trade involves importing the distorted good and with a Constant Elasticity of Substitution formulation, greater substitutability results in gains from trade. The more substitutable the goods are in consumption, the greater the price effect through trade. As the price effect is beneficial, trade tends to raise welfare.

This paper builds on Krishna and Yavas (2002), which uses a Ricardian setup to show how such labor market distortions in transition and developing countries affect the level and distribution of income and hence the demand for indivisible consumer goods. In their model, effects in transition and developing economies differ, though the basic story is similar. They argue that in the absence of trade, wages are high due to the distortion, and as a result demand for indivisibles is high, which sustains these high wages. However, as the cost of the distorted good is higher in the distorted economy, it tends to be imported, with adverse consequences on the level and distribution of income.

Such factor market distortions have similar effects even when goods are divisible. By modifying the standard trade models, namely the Ricardian, Specific Factors, and Hecksher Ohlin models, we are able to look at a wider set of issues.

Section 2 develops the Ricardian model and shows how this distortion affects labor allocation and output and why trade always makes existing distortions worse. We also look at the effects of substitutability between goods on the gains from trade for a distorted economy. Section 3 develops the Specific Factors model and argues that similar effects obtain when the marginal productivity of labor is diminishing. Section 4 deals with the Hecksher Ohlin model of trade with an endogenous allocation of capital and shows that it does not alter the flavor of the results either. Section 5 contains some final remarks.

2 The Ricardian Model

There are two economies, Home and Foreign, which have access to the same technology, but differ in their institutional arrangements[2]. There are a continuum of individuals, indexed by γ, who are uniformly distributed on the unit interval with density related to the labor size. Type γ is endowed with γ units of effective labor. There are two goods, X and Y, and both goods are produced under competitive conditions. It takes one unit of effective labor, E, to make a unit of either good.

Let Y be the numeraire good with a price of unity. Let I be the total income of the economy, and let P and P^* denote the autarky price of X in Home and Foreign. Let L and L^* be the size of the labor force, i.e., the density of the distribution of γ, in Home and Foreign, respectively. Labor in the Y sector is paid the value of its marginal product in both economies. Labor in the X sector is paid its marginal product in Foreign, but is paid a constant wage per worker, independent of ability, in Home.

2.1 Autarky Equilibrium

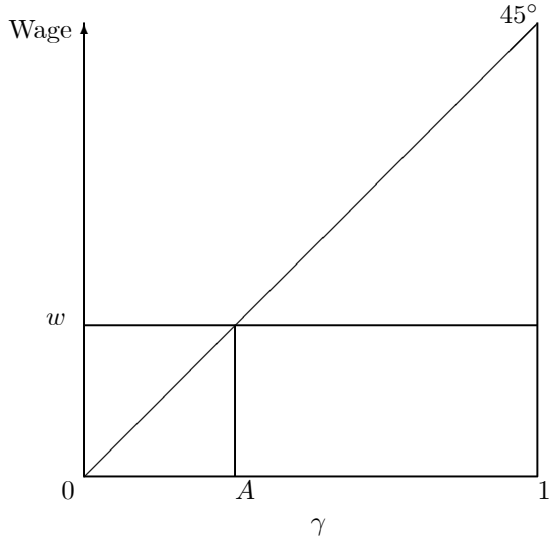
In the undistorted economy, called Foreign, a worker with productivity γ earns γ if he works in Y and γP^* if he works in X. For both goods to be produced, P^* has to equal 1.[3]

Let $\bar{w}$ be the fixed wage per worker in sector X in the distorted economy. This fixed wage has two interpretations. It can be interpreted as the wage per worker paid by state owned manufacturing firms. Alternatively, it can be interpreted as the income of a worker who works in the family farm and obtains

[2]Since we are looking at the effects of different labor market institutions we abstract from differences in technology. These can be easily added to the model.

[3]For both goods to be produced, there must be some workers willing to work in each sector. However at any $P^* \neq 1$, all workers will prefer working in one or the other.

Figure 1: The Allocation of Labor Between Sectors in the Distorted Economy



the average product there.[4] The allocation of labor is depicted in Figure 1. At wage w, workers with $\gamma > w$, that is workers in OA, choose to work in X. The remaining workers choose to work in Y. An increase in the wage rate attracts workers with higher ability into X and raises the average quality of labor there.

At wage $\bar{w}$, and assuming γ is uniformly distributed, $\bar{w}L$ workers are employed in X, and total labor cost is $\bar{w}^2 L$. On average, each worker has $\frac{\bar{w}}{2}$ effective units of labor. Total output of X at this wage, denoted by $X(\bar{w})$, is their product,

$$X(\bar{w}) = \frac{\bar{w}^2}{2} L.$$

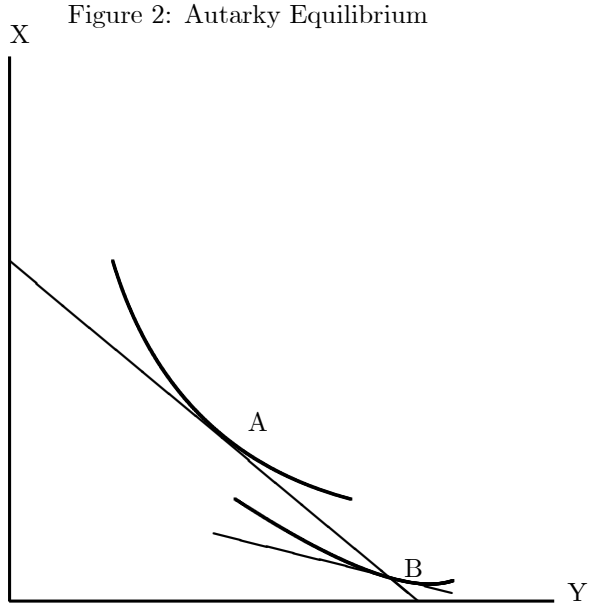
Hence, cost per unit of good X, and hence its price, P, is 2.

In Home, as a result of the fixed wage per worker in sector X, workers (other than the marginal one) earn more than they would in the undistorted sector.[5] This raises the cost of producing good X, and hence its price. This, in turn, reduces the demand and output of the distorted sector in autarky equilibrium.

[4] We asssume that all family farms have the same average ability.

[5] Note that in the market economy, the productivity of the workers in X is equal to the value of marginal product in Y.

Figure 2: Autarky Equilibrium



Thus there are too few workers in the X sector. This is depicted in Figure 2. The Production Possibility Frontier (PPF) of the distorted economy is the same as that of the undistorted one and given the Ricardian setup, it is linear. The undistorted economy produces at point A where the indifference curve is tangent to the PPF. As there is no unemployment, the distorted economy remains on the PPF. However, it produces at the wrong point, at B, making too little X. At B the price line is flatter than the PPF but is tangent to the indifference curve since consumption decisions are not distorted.[6]

[6]In the extreme case where goods are perfect complements, the consumption and hence output levels in a distorted economy under autarky are the same as in an undistorted economy. However as long as there is any substitutability, there is too little output in the distorted sector.

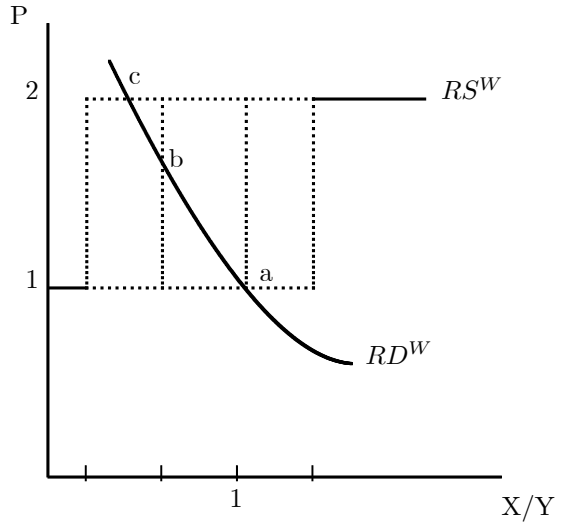
2.2 Trade Equilibrium

Trade equilibrium is best understood using the standard relative demand (RD) and relative supply (RS) framework. In Figure 3, RS^W depicts the world relative supply. At $P = 1$, the undistorted economy becomes willing to produce good X and it can produce up to $\frac{L^*}{2}$ units while the distorted economy produces only good Y, $\frac{L}{2}$ units of it. Thus, the relative supply of good X at $P = 1$ is, at most, $\frac{L^*}{L}$. For $P \in (1, 2)$, $RS^W = \frac{L^*}{L}$. At $P = 2$, the distorted economy also becomes willing to produce good X and RS^W becomes horizontal. Thus, the price under free trade, P^F, depends on the relative size of the two countries, L and L^*.

Given identical homothetic preferences across countries, the world relative demand $\left(RD^W\right)$ depends on relative prices alone and is identical to that for either country. If, in addition, X and Y enter preferences symmetrically, then $RD^W = 1$ at $P = 1$. Since relative supply at $P = 1$ is at most $\frac{L^*}{L}$, if $\frac{L^*}{L} < 1$, then the intersection of RS^W and RD^W must occur at a point like b or c in Figure 3. Hence P^F must be greater than unity, and the undistorted economy completely specializes in good X. If $\frac{L^*}{L} \geq 1$, then this intersection must occur at a point like a in Figure 3. So $P^F = 1$ and the distorted country completely specializes in good Y.

This pattern makes sense since if $\frac{L^*}{L} < 1$, then Foreign is small relative to Home, and it must specialize in the distorted good, X, in which it has a comparative advantage. On the other hand, if $\frac{L^*}{L} \geq 1$, then Foreign is large relative to Home, it can produce enough to meet world demand of good X, and therefore Home completely specializes in the undistorted good, Y, in which it has a comparative advantage.

Figure 3: Trade Equilibrium in the Ricardian Model



2.2.1 Welfare Effects

The undistorted economy never loses from trade. The effects on the distorted economy are varied. There are two effects at play. Recall that the distorted economy produces too little of the distorted good in autarky, and it has a comparative disadvantage in its production. Trade makes this distortion worse as the country produces even less of the distorted good after trade. There may however be a welfare gain through lower prices of X. The net effect depends on which one dominates. If substitutability between goods is parameterized using a constant elasticity of substitution (CES) utility function, simulations show that welfare rises due to trade for $(\sigma, \frac{L^*}{L})$ that lie above a weakly downward sloping curve denoted by $\sigma(\frac{L^*}{L})$.

If $\frac{L^*}{L} \geq 1$ then Home makes only Y. Hence, the output effect is adverse. However, as $P^F = 1$, Home obtains the same welfare as that of an undistorted

economy. Hence, trade must always raise welfare in Home.

If $\frac{L^*}{L} < 1$ then P^F must exceed unity, occurring at a point like b or c in Figure 3. For a given $\frac{L^*}{L}$, the lower the substitutability the higher the price in free trade. This occurs because when goods enter preferences symmetrically, the relative demand curve must always go through the point $(1, 1)$, i.e., the point a in Figure 3. It is easy to see that when σ is high enough the free trade price is close to unity, so Home welfare under trade approaches that of an undistorted economy. As a result, Home gains from trade. As σ falls from this high value, relative demand becomes steeper, rotating about the point $(1, 1)$. Since $\frac{L^*}{L} < 1$, the intersection with relative supply occurs at a higher price. At some level, say $\hat{\sigma}$, P reaches 2. At this level of σ, welfare must fall due to trade since Home makes only Y and prices are its autarky prices. By continuity, at some value of σ in between Home neither gains nor loses from trade.

Once σ reaches $\hat{\sigma}$, further decreases in σ do not affect the price in free trade. However, Home starts to produce both X and Y. In this region, Home must lose from trade as there is no positive price effect, and since Home imports X its production of X must be lower than under autarky.[7]

3 Specific Factors Model

Would the results derived above carry through if labor faced diminishing returns as it would in the presence of other factors? In the next two sections we show that their spirit does indeed carry through.

Consider the specific factors model. Each sector has a fixed amount of a specific factor which cannot move across sectors while labor is mobile. We assume that Home and Foreign are identical in every respect except that Home has a labor market distortion in X. Let E^i denote the effective units of labor

[7]Suppose its output of X was the same as under autarky. Then as price is the same as Home's autarky price, it must neither import not export which is a contradiction.

employed in sector i, and K^i denote the fixed amount of specific factor employed in sector i, for $i = X, Y$. Let $X(E^X, K^X)$ and $Y(E^Y, K^Y)$ denote the constant returns to scale production functions for the two sectors, and let the price of Y be unity so that P denotes the relative price of X.

3.1 Autarky Equilibrium

As before, X pays a fixed wage per worker regardless of workers' ability while workers earn the value of their marginal product in Y. As a result of this, lower ability workers prefer to work for X while higher ability workers opt for Y. Let $\tilde{\gamma}$ be the worker who is indifferent between working for X and Y.

Let $w^e = Y_1(.)$ be the wage per effective unit of labor in Y (where subscript i denotes the derivative with respect to the ith argument). The earnings of a worker with ability γ in Y are $w^e\gamma$ while the earnings of a worker in X are $\bar{w}$. In equilibrium, the highest ability worker in X, or $\tilde{\gamma}$, is indifferent between the two sectors so that

$$w^e\tilde{\gamma} = \bar{w}. \tag{1}$$

Note that a worker's decision whether to work for X or Y depends on $\frac{\bar{w}}{w^e}$. As this goes up, $\tilde{\gamma}$ rises, and the number of workers as well as the effective labor in X rises while that in Y falls.

What determines the allocation of effective labor in equilibrium? Note that given our assumption that ability is distributed uniformly over the interval $[0, 1]$, the average ability of workers employed in X is $\frac{\tilde{\gamma}}{2}$. We assume competition so that firms in X take $\bar{w}$ and the average ability of the work force, $(\frac{\tilde{\gamma}}{2})$, as given, and choose only how many such workers to hire.

Thus, the problem faced by firm j in X facing P, $\tilde{\gamma}$ and $\bar{w}$ is

$$\max_{n_j} \; PX(n_j\frac{\tilde{\gamma}}{2}, K_j^X) - \bar{w}n_j$$

where n_j is the proportion of labor force employed by firm j, and hence $n_j\frac{\tilde{\gamma}}{2}$ is the total units of effective labor employed by firm j, denoted by E_j. K_j^X is the amount of the factor specific to X that firm j has. The first order condition of the problem yields

$$PX_1(n_j\frac{\tilde{\gamma}}{2}, K_j^X)\frac{\tilde{\gamma}}{2} = \bar{w}$$

which in turn implies that

$$P = \frac{\bar{w}}{\frac{\tilde{\gamma}}{2}X_1(E_j^X, K_j^X)}. \tag{2}$$

Since all firms face the same prices and wages, their marginal products are equalized. Given constant returns to scale production functions, marginal products are homogeneous of degree zero and depend only $\frac{E_j^X}{K_j^X}$. Hence, it is equal for all firms and equal to that for the hypothetical aggregate firm. Thus,

$$X_1(E_j^X, K_j^X) = X_1(E^X, K^X). \tag{3}$$

Using equation (3) and substituting for $\bar{w}$ using (1) into (2), and noting that $w^e = Y_1(.)$ gives

$$P = 2\frac{Y_1(.)}{X_1(.)} \tag{4}$$

as the relation defining the allocation of labor and relative supply in the distorted economy.

Also note that when factors are paid in this manner, the value of output exactly equals factor payments.

$$\begin{aligned} PX(E_j^X, K_j^X) &= P[E_j^X X_1(.) + K_j^X X_2(.)] \\ &= P[\frac{\tilde{\gamma}}{2}n_j X_1(.) + K_j^X X_2(.)] \\ &= \bar{w}n_j + rK_j^X. \end{aligned}$$

The first equality follows from constant returns to scale. The second equality follows from the fact that hiring n_j workers of average quality $\frac{\tilde{\gamma}}{2}$ gives the

effective labor E_j^X. The last follows from (2) and competitive capital markets. As a result, whether one thinks of a fixed wage per person being paid in X or whether one thinks of workers in X being equal residual claimants to output in X (once capital has been paid) gives the same result.

In an undistorted economy the marginal value products of the two sectors are equalized so that

$$PX_1(.) = Y_1(.),$$

and relative supply is given by

$$P = \frac{Y_1(.)}{X_1(.)}.$$

Figure 4 illustrates these relative supply curves. For any given allocation of labor, and hence supplies, the price needed to elicit this relative supply in the distorted economy is twice that needed to elicit the same relative supply in the undistorted economy. Hence, at any given horizontal coordinate in Figure 4, the vertical coordinate of RS is twice that of RS^*. Given that preferences are identical and homothetic, relative demand is the same in all economies, so that differences in relative supplies translate to a higher autarky price of X in the distorted economy. In Figure 4, point A depicts the autarky equilibrium in Foreign, and point B depicts the autarky equilibrium in Home.

Given the higher autarky price, the distorted economy's relative demand for, and hence supply of, good X is lower than that in an undistorted economy, and therefore sector X in a distorted economy employs too little effective units of labor relative to an undistorted one.

These results can be better understood using Figures 5 and 6. Figure 5 illustrates the allocation of effective units of labor using the standard specific factors diagram. The two ends of the box are the origins for the two sectors and the downward sloping curves (with respect to their origins) depict the value

Figure 4: Equilibrium in the Specific Factors Model

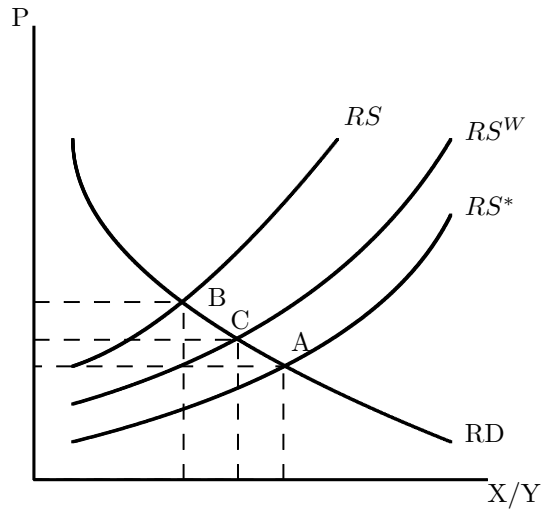
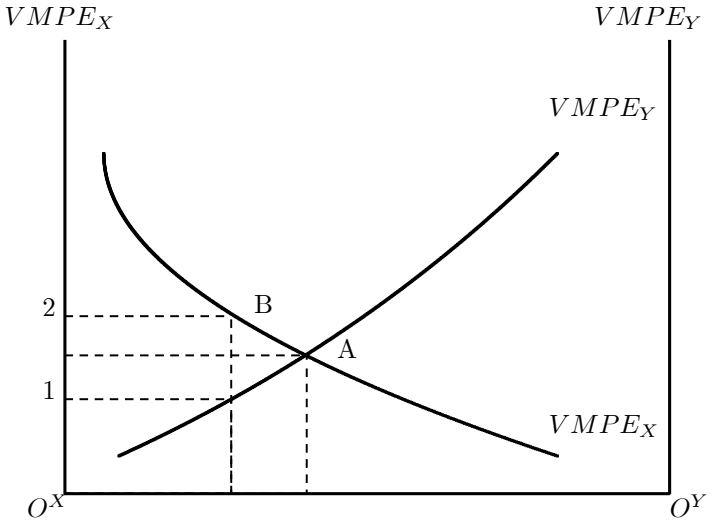


Figure 5: Allocation of Effective Labor



of marginal product of an effective unit of labor in each sector. In the absence of a factor market distortion, the marginal productivity of labor in each sector is equalized. This is represented by point A. On the other hand, with labor market distortions, from (4) , it follows that

$$PX_1(.) = 2Y_1(.)$$

and the marginal value product of an effective unit of labor in X equals twice that in Y. In other words, the equilibrium allocation of effective units of labor is such that the vertical length of the $VMPE_X$, denoted by w^X, is twice that of the $VMPE_Y$, denoted by w^Y, as illustrated by point B in Figure 5. Note that at any price, less of X is made and more of Y is made as a result.[8]

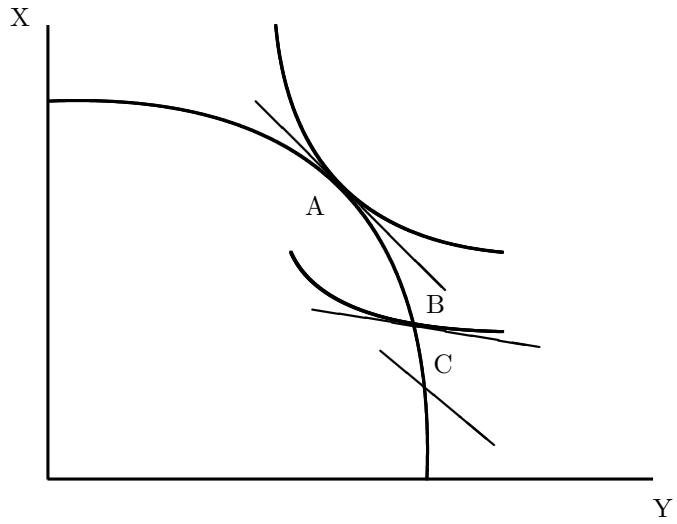
Figure 6 depicts the production possibilities frontier for the distorted and undistorted economies, as well as production (which equals consumption) in autarky. Both economies have the same production possibility frontier (PPF) by assumption, and they both produce on the frontier as there is no unemployment in either. In the undistorted economy, the autarky relative price of good X (of $\frac{Y_1(.)}{X_1(.)}$) is tangent to both the PPF and to the indifference curve of the economy at point A. On the other hand, the distorted economy has a higher autarky relative price of good X, (of $\frac{2Y_1(.)}{X_1(.)}$) and it consumes and produces less X as depicted by point B. Moreover, the slope of the PPF at B is steeper than the price ratio which equals the slope of the indifference curve through B. Note that as a result its welfare is below that of the undistorted economy.

3.2 Free Trade Equilibrium

What will be the effect of trade in this environment? Does the distortion always get worse as in the Ricardian model, or can it get better? The answer follows

[8]With many sectors the same arguments work. As in Figure 5, draw the horizontal sum of $VMPE$ in each distorted sector using O_X as the origin and the the horizontal sum of $VMPE$ in each undistorted sector using O_Y as the origin. In equilibrium, the $VMPE$ in each distorted sector equals the twice that in each undistorted sector.

Figure 6: A Comparison of Equilibria



quite simply. Given the relative supplies of the two economies as depicted in Figure 4, the world relative supply is given by RS^W which must lie in between RS and RS^*. As relative demand for the world equals the common relative demand of the two countries, the free trade price must lie in between two autarky prices, as depicted by point C in Figure 4. Therefore, after opening up, Home observes a decline in the relative price of good X and hence its relative supply falls short of its relative demand and it imports good X and exports good Y.

Note that a reduction in relative supply of X moves Home along its PPF to point C in Figure 6, thereby worsening the distortion in output. At given prices, this reduces welfare. However, the price of X also falls through trade. As Home is an importer of X, this raises welfare. The net effect of trade depends on which of these two effects, the output effect or the price effect, dominates. Under free trade, Home consumption lies along the line through C with slope

P^F. It lies to the left of C as X is imported. Similarly, Foreign consumption in Free trade lies along the line through D with slope P^F. It lies to the right of D as X is exported.

As an economy gets larger, the relative price in the free trade equilibrium approaches its autarky price, and therefore the extent of the beneficial price effect falls. If Home country is very large, then the free trade price will be very close to its autarky price, and the price effect will be negligible. On the other hand, since the other country will export good X and import good Y at, the output effect will remain. Therefore, it follows that a large economy must lose from trade.[9]

It is worth noting that trade between two distorted economies, one with a distortion in X and the other with a distortion in Y, causes the distortion in both countries to get worse as each country has a comparative disadvantage in the production of the good in which it has a distortion, and it will import this good in trade equilibrium producing even less of it.

4 Heckscher-Ohlin Model

What makes the Heckscher-Ohlin model different from the specific factors model is the assumption that K as well as E is mobile across sectors. This allows us to ask how the allocation of capital is affected by the distortion in the labor market, the effects of trade on this allocation decision, as well as the consequences of endogenous capital allocation for trade.

Assume, as usual, that there are no factor intensity reversals. Let $c^X(w,r)$ and $c^Y(w,r)$ denote the unit cost functions in the two sectors in the absence of any distortions where w is the wage per effective unit of labor and r is the

[9]Different groups are affected by trade as in the standard specific factors setup. The real return to the specific factor whose relative price goes up rises, while that of the other specific factor falls. The effect on the real return of labor depends on their preferences.

rental rate. In equilibrium, $c^X(w,r) = P$ and $c^Y(w,r) = 1$. These conditions are depicted in Figure 7 by the curves X and Y respectively. For both goods to be produced, factor prices must lie at their intersection, namely A.[10] As in the standard model, price cannot exceed cost as profits are zero, and if cost exceeds price, output is zero.

In the presence of the distortion, the wage per efficiency unit of labor will differ between sectors. If the wage per efficiency unit of labor in Y is w^Y, then workers choose between earning $w^Y\gamma$ in X and $\bar{w}$ in Y. The marginal worker, type $\tilde{\gamma}$, gets the same in both sectors so that

$$w^Y\tilde{\gamma} = \bar{w}. \tag{5}$$

Note that each worker in X has an average efficiency of $\frac{\tilde{\gamma}}{2}$. Let w^X denote the implicit wage per efficiency unit in X. Thus, using (5) gives

$$w^X = \frac{\bar{w}}{\frac{\tilde{\gamma}}{2}} = 2w^Y.$$

As there is no capital market distortion, r is common to both sectors. Consequently,

$$c^X(2w^Y, r) = P \tag{6}$$

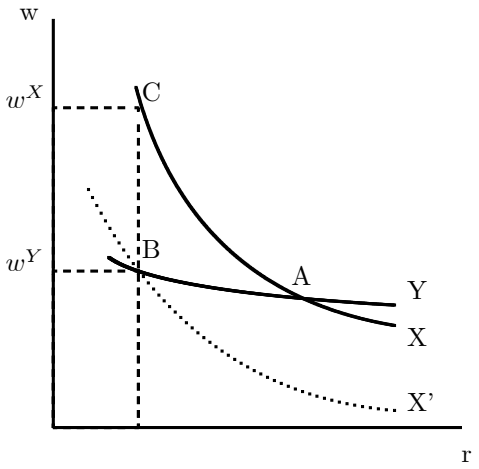
and

$$c^Y(w^Y, r) = 1 \tag{7}$$

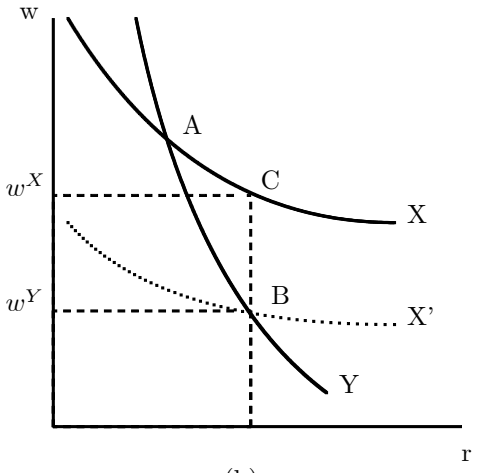
give the analogous equilibrium conditions in the distorted economy. The curve X' which lies halfway between the curve X and the horizontal axis depicts (6) in Figure 7. In the absence of specialization, factor prices are given by the point B for the Y sector and the point C for the X sector. It is worth noting that the factor market distortion can easily lead to specialization in Y at a given price as X' and Y may not intersect though X and Y do. The specialization

[10] See Mussa (1979) for the classical exposition of the Hecksher Ohlin model in terms of its dual.

Figure 7: Factor Price Frontier



(a)



(b)

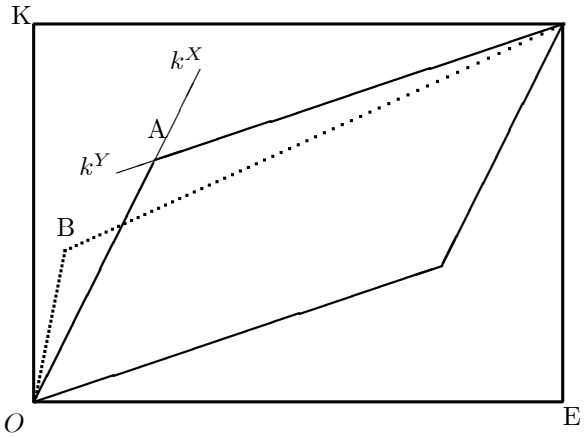
in Y can be analyzed along standard lines. Here we focus on the case where both countries produce both goods. We look at how the distortion affects factor prices, capital labor ratios, factor allocations and output in a distorted economy relative to an undistorted one and whether it depends on whether X is capital intensive relative to Y or not.

If X is capital intensive, as depicted in Figure 7(a), then the wage-rental ratio, and hence capital-effective labor ratio, rises in both sectors relative to that in the undistorted economy. Since C is vertically above B, the wage-rental ratio rises by more in X than in Y, and X remains relatively capital intensive. Since total capital and labor is given, the only way for capital intensity to rise in both sectors is for the output of the labor intensive good, Y, along with the allocation of both factors to Y, to rise.

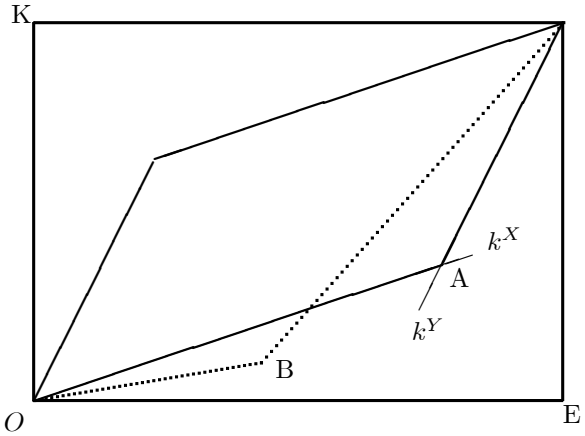
This is easy to verify using the standard Rybczynski box with dimensions K and E, the availability of capital and effective labor in the economy, as depicted in Figure 8. Factor market clearing can be depicted by adding the vector of factor use in X to that in Y (or Y to X) and having this sum reach the other end of the box, i.e., factor markets clear. If X is capital intensive, then the ray denoting the vector of factor use in X is steeper than that in Y, as depicted in Figure 8(a). For given wage-rental ratios, the output levels and factor usages in the two sectors are implicitly given by the intersection of the two rays, at point A. The coordinates of point A give the capital and effective labor usage in X while the remaining factors are used in Y. An increase in the wage rental ratio raises the capital-effective labor ratio in both sectors, making both rays steeper. At the new intersection, at point B, X must use less capital and less effective labor, so that at a given price, relative supply of X is lower in the distorted economy.

What if X is labor intensive, as depicted in Figure 7(b)? At a given price,

Figure 8: The Rybczynski Box



(a) X is Capital Intensive



(b) X is Labor Intensive

if both goods are made, the distorted economy has a lower wage-rental ratio, and hence capital-effective labor ratio, relative to the undistorted economy in both X and Y since the slope of the line from the origin through A exceeds that through B or C. The only way for capital intensity to fall in both sectors is for the output of the capital intensive good, Y, along with the allocation of both factors to Y, to rise. Again, this is easy to verify using the Rybczynski box. If X is the labor-intensive sector, then the ray denoting the vector of factor usage in X is flatter than that in Y as illustrated in Figure 8(b). A decrease in the wage-rental ratio will reduce the capital-effective labor ratio in both sectors. In the Rybczynski box, this corresponds to both rays getting flatter. At the new equilibrium, at point B, sector X uses less capital and less effective labor, and hence relative supply of X is lower in the distorted economy, as earlier.

One might ask at this stage why X must be labor intensive relative to Y in the distorted economy. Since the wage-rental ratio, and hence, one might argue, the capital-effective labor ratio, could rise by more in X than in Y, it seems that X might become the capital intensive sector in the distorted economy, despite the absence of factor intensity reversals. That is, what prevents the slope of X at C from exceeding that of Y at B? We argue that this cannot happen in the absence of factor intensity reversals. The reasoning is simple. Fix a price. Assuming that both goods are made in the undistorted economy, the capital-effective labor ratio in the two sectors in the undistorted economy must bracket the economy's capital-effective labor ratio. As X is labor intensive, its capital-effective labor ratio must lie below k, the capital-effective labor ratio of the economy as a whole, while that of Y must lie above k. Since the wage rental ratio falls in both X and Y, so do capital labor ratios. If the capital-effective labor ratio in Y falls so much that it lies below that in X, both sectors' capital labor ratios must lie below k. However, this is inconsistent with factor markets

clearing in the distorted economy.

Thus, whether X is capital or labor intensive, the distortion in the labor market in X results not only in a decrease in the allocation of labor to X but also a decline in capital allocated to X at given prices. In other words, the effects of distortion on the relative supply of X is more pronounced than in the specific factors model where capital could not move across sectors. The relative supply for the distorted and undistorted economies (RS and RS^*) are as in Figure 4. As relative demand is the same for both, the points E and F depict their autarky equilibria. Since RS lies to the left of RS^*, the autarky price in the distorted economy must exceed that in the undistorted one and the free trade price lies in between them. As a result, the price of X in the distorted economy falls due to trade, and it imports X which further reduces its output of it. Once again, while the price effect of trade raises welfare in the distorted economy, the output effect reduces it. The net effect will depend on which of these dominates as earlier.

Our main results are thus independent of which model we choose to use. The factor market distortion creates a comparative disadvantage in X. The price of X falls through trade for the distorted economy but as X is imported so does its output. The fall in the price of X raises welfare while the fall in output of X makes existing distortion worse.

5 Conclusion

The last decade has seen a large number of countries embracing trade reforms. However, many of them have not been able to emulate the success of the fast growing East Asian countries. Our analysis suggests that labor market distortion prevalent in developing countries might lead to a fall in welfare, especially for a large country, when such economies open up to trade. While the East

Asian economies were small, economies that have not done as well tend to be larger.

Our results are consistent with the experiences of some transition economies. Most sectors in the erstwhile socialist economies were state owned in the old regime. This corresponds to all sectors having the labor market distortion. It is easy to verify that in our model if all sectors are distorted, production decisions remain efficient. Reform consisting of privatizing some sectors would however result in inefficiencies in production decisions, which would be worsened through trade. This is yet another example of the Theorem of the Second Best and the dangers of partial reform. Our analysis suggests that a dip in national income occurring in the initial stages of privatization is likely. This is consistent with the initial post reform experience of almost all transition economies, see Figure 1.2 in a recent monograph, World Bank (2002). Boeri and Terrell (2002) argue that part of the reason for the differing experiences in transition of the countries of the Former Soviet Union (FSU) and those of the Central and Eastern European (CEE) can be explained in part by the different labor market policies they adopted.[11]

While our work here focuses on the implications of a labor market distortion, there are, of course, many other aspects of the experience of both developing and transition economies which are not addressed here. Many reasons have been put forward to explain the differential performance of developing economies. See, for example, Krueger (1984) and Ray (1998) for an overview of some of this literature. Similarly, there have been a number of interesting hypotheses put forward to explain the sharp decline in industrial output and GDP in Eastern Europe and the former Soviet Union countries. These include slow adjustment

[11]The CEE countries propped up wages at the bottom of the distribution while the FSU countries allowed greater wage flexibility. As a result, unproductive sectors collapsed more in the former than in the latter.

resulting in unemployment, see Gomulka (1992), investment delays caused by the unwillingness to invest till a good match is found since investment is relation specific, see Roland and Verdier (1999), and the disorganization hypothesis of Blanchard and Kremer (1997), where strong complementarities between inputs allows suppliers to exercise their bargaining power and disrupt production chains.

Our work has some natural extensions. In this paper, we assume that when there are other scarce factors of production, labor in the distorted sector shares the residual output after these factors are paid the value of their marginal product. This corresponds to the existence of a perfect market in land and capital. All those who own land or capital earn the return from it and this is separate from who works it. However, in many developing countries, leaving the family farm means giving up your rights on the land, and workers who remain in the family farm share the entire output of the farm. The implications of such a labor market distortion are different than the one analyzed here. For one, the factor market distortion could result in too little or too much being produced.

Another natural extension concerns capital flows. There have been large capital flows between market economies and transition and developing economies (see Lucas (1990)). Here we do not allow capital to move between countries. Augmented versions of this model can also help explain the simultaneous occurrence of factor movements and goods trade without resorting to explanations relying on trade barriers (as does the work on Multinationals) or adjustment costs (which results in capital flows being spread out over time). Extending the model in these directions is part of an on-going research agenda.

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