

When Trade Hurts: Consumption Indivisibilities and Labor Market Distortions¹

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September 2004

¹We are grateful to Jim Anderson, Abhijit Banerjee, Don Davis, Jonathan Eaton, Elhanan Helpman, two referees and participants at the 2001 ITI Summer Institute at the NBER, the Fall 2001 Midwest Trade Conference, the IEFIS session at the ASSA in 2002, and the ETSG meetings in 2002 for comments.

Abstract

This paper argues that when there are indivisibilities in consumption, sector specific labor market distortions that sever the connection between wages and ability may raise the output of the distorted sector, despite raising its costs. Such distortions also make losses from trade large and likely for such economies. Our model suggests that trade liberalization without structural reform can have serious adverse effects in transition and developing economies: there can even be mutual losses from trade.

1 Introduction

Countries in transition to a capitalist economy, such as those in the former Soviet Union, have industrial enterprises that remain under state control. Such enterprises offer wages that are only loosely tied to productivity, and hence attract less able workers.¹ For such countries, trade has been coupled with industrial contraction: for example, during the 90's the share of industry fell by about 22 percent for countries in the former Soviet Union.²

There have been a number of interesting hypotheses put forward to explain this phenomenon. These include slow adjustment 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 allow suppliers to exercise their bargaining power and disrupt production chains.

We offer an alternative explanation that relies on labor market distortions, which can be interpreted as institutional differences. Our model has two goods, and a single factor, labor, which differs in its productivity. One of the goods, which can be thought of as a lumpy consumer good like a refrigerator or car, is indivisible in consumption: either zero or one unit of it can be

¹Jefferson (1999) argues that “the inability of state enterprises to monitor and reward high quality labor is likely to create an adverse selection problem in which the most skilled and motivated workers exit from the state sector...”.

²See the World Development Report (2001) for details.

consumed.³ In this sector, all workers are paid the same independent of their productivity. This factor market distortion results in adverse selection: only less productive workers are attracted to this sector.⁴ It also raises cost in the affected sector as infra-marginal workers are paid more than their opportunity cost. Our model suggests that in such a setting, there is good reason to expect trade to have adverse welfare effects: for a large economy it may even result in a Pareto inferior outcome.

The argument relies on the complementarity between wages and demand due to adverse selection in the labor market. Prior to trade, a virtuous circle prevails: high wages support a high demand for indivisible industrial goods, which in turn supports high wages. If opening up to trade results in the import of indivisibles, manufacturing wages fall, breaking this virtuous circle.⁵ Trade also has the usual beneficial effect through price changes. If the transition economy importing indivisibles is large, there is no price effect and trade is, in fact, weakly Pareto inferior to autarky! Consequently, trade liberalization without structural reform can have serious adverse effects in a transition economy.

It is well understood that in the presence of existing distortions, trade

³Although goods can be made divisible by renting or sharing, an essential indivisibility remains since it is more costly to rent than buy and there are moral hazard problems involved in sharing.

⁴This wage structure may arise because of a social commitment to income equality, as in Scandinavia, or an inability to identify worker productivity. The latter is likely if the production process is relatively complicated.

⁵Such complementarities are the focus of Murphy, Shleifer and Vishny (1989) and Matsuyama (1995), among others.

liberalization may have adverse effects. While there has been a large literature in the area of trade with factor market distortions, much of it focuses on minimum wages in manufacturing: see for example Brecher (1974a,b) and Davis (1998). Also see Magee (1973) for a survey of this work. Furthermore, the literature on factor market distortions in a general equilibrium trade setting assumes identical homothetic preferences. As a result, the effects of trade through their effects on the distribution of income are assumed away. Our emphasis is precisely this channel. Consumption indivisibilities are a reasonable and tractable way of incorporating non homotheticity.

Our model also applies to developing economies. A widely held view is that in developing economies, workers in agriculture are employed in family farms and earn the average product of labor. The development literature assumes diminishing marginal product in agriculture. Hence, the average product exceeds the marginal product. If workers obtain the average product of labor, then too many workers will choose to remain in agriculture. This is the thesis of “disguised unemployment”, see Sen (1960).

When labor is of differential productivity, as in our model, the above result is reversed! Since lower quality labor remains in agriculture, the marginal worker produces more than labor does on average, so too few workers remain in agriculture rather than too many!⁶ The distortion raises the cost of production of the distorted sector, and hence, reduces the relative cost of

⁶This is consistent with Lipton (1977) who points out that per capita income tends to be significantly lower in rural areas, especially in developing countries.

indivisibles. Also, higher incomes earned by less able workers increase the potential market size for indivisibles. Trade can reduce social welfare in such an economy when it involves importing the divisible good.⁷ Increased output of the indivisible good reduces the labor force and average quality of labor in agriculture, thereby reducing the earnings of those in agriculture, and hence the ability to afford the indivisible good.

In the standard setting with identical homothetic preferences,⁸ the factor market distortion we model would have to reduce the output of the distorted sector in a closed economy. Why? The distortion raises relative costs and hence price, thereby reducing relative demand. Since there is no unemployment, output of the distorted sector must be lower! In contrast, non homothetic preferences allow demand complementarities to come into play, so that the factor market distortion could raise the output of the distorted sector in autarky. Consumption indivisibilities generate such non homotheticities. They also provide a setting where the location of the factor market distortion, in divisibles or indivisibles, matters.⁹

Section 2 develops the model. Section 3 analyzes equilibrium in the tran-

⁷There could even be mutual losses from trade when a developing country exports the indivisible good to a transition economy.

⁸With the standard assumption of identical homothetic preferences, demand depends on aggregate income and is independent of its distribution. If preferences are not identical and homothetic, then there are few restrictions on excess demand functions in general equilibrium so that this approach is not tractable. On the other hand, quasi linear utility, adopted in the industrial organization and strategic trade literature, removes all income effects.

⁹Trade can make things worse without indivisibilities as well. See, Krishna, Mukhopadhyay and Yavas (2002).

sition economy. Section 4 extends the analysis to when the factor market distortion is in divisibles. Section 5 contains some concluding remarks and directions for future work.

2 The Model

There is a continuum of individuals differentiated by their productivity denoted by γ . Let γ be distributed over the unit interval and have a cumulative density function denoted by $F(\cdot)$. There are two goods in the economy, indivisible and divisible, and both goods are produced under competitive conditions. The divisible good is taken as the numeraire and let P denote the price of the indivisible good.

2.1 Supply

A worker with productivity γ can make γ units of the divisible good, or $\alpha\gamma$ units of the indivisible good. In the absence of factor market distortions, a worker of type γ chooses between earning $P\alpha\gamma$ in indivisibles and γ in divisibles. Consequently, for both goods to be produced, P must equal $\frac{1}{\alpha}$. Of course, this also equals cost, denoted by c .

Suppose workers are paid a wage, w , independent of their ability in the indivisible good sector, but earn the value of their marginal product in divisibles. Workers with $\gamma < w$ will choose to work in indivisibles, while the remainder will choose to work in divisibles.

Lemma 1: *Unit costs in a transition economy, $c(Q)$, must exceed those of a similar market economy.*

Proof: *In a market economy, all workers are paid what they would earn in divisibles. In a transition economy, all workers, except the marginal one, are paid above this level, which makes the cost of producing indivisibles higher than that in a market economy with the same technology.*

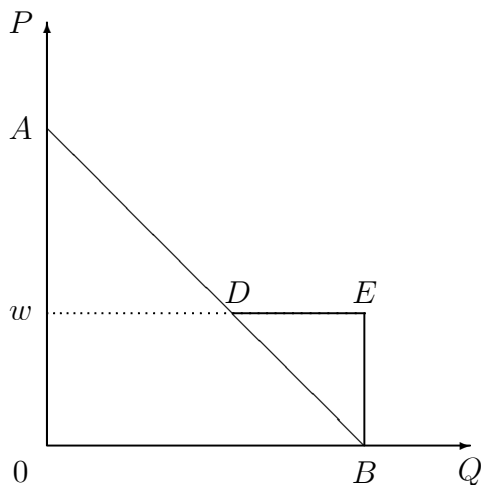
2.2 Demand

We assume that utility is additively separable. Consumers obtain utility V if they purchase the indivisible good, and obtain $U(n)$ if they buy n units of the divisible good. For simplicity, we also assume that $V > U(P) - U(0)$. In other words, indivisibles are highly valued.¹⁰ Consequently, all consumers with income exceeding the price of the indivisible good purchase it.¹¹ In this manner, demand for the indivisible good depends on the distribution of income. If there are no factor market distortions, demand tracks the distribution of ability. The wage distortion in a transition economy makes demand depend on the wage in indivisibles. On the other hand, the wage in indivisibles depends on demand. This circular causation is at the heart of the model.

¹⁰Consequently, raising the consumption of indivisibles tends to increase utilitarian social welfare. Our results do not depend on this assumption as shown in Krishna and Yavas (2002).

¹¹Indirect utility is not concave in income because the marginal utility of income jumps up at $I = P$. This makes individuals risk lovers in this region. This was pointed out in Ng (1965).

Figure 1: Demand for Indivisibles



If the wage in indivisibles is w , all workers with $\gamma < w$ earn w , causing demand to jump to the right at $P = w$. Figure 1 depicts demand when ability is uniformly distributed over the unit interval: AB depicts demand for a market economy and $ADEB$ depicts demand for a transition economy with wage w .

2.3 Equilibrium

We now put demand and cost together to derive equilibrium. This is simple for a market economy where the cost is $\frac{1}{\alpha}$ and demand is $1 - F(P)$. Since firms price at cost, equilibrium output is $Q^M = 1 - F(\frac{1}{\alpha})$, which is increasing in α .¹² Note that all agents can never afford the indivisible, i.e., $Q^M < 1$.

¹²For indivisible goods to be produced, it must be the case that $\alpha > 1$. Otherwise, even the most productive worker would not be able to afford the good when it is priced at cost. Since costs in a transition economy always exceed those in a market economy, α must be strictly greater than unity for viability of the indivisible good sector in a transition economy.

There is full employment in our model. Hence output lies on the production possibility frontier in both the market and transition economies. What can we say about the output of indivisibles in the two economies? One might guess that since the distortion raises the relative cost, and hence price, of indivisibles; it would reduce their output. However, this is not necessarily so.

There are two opposing forces at work. On the one hand, the factor market distortion raises the cost and hence price of indivisibles, which reduces output. On the other hand, the distortion also raises the income of the less able to w , the flat wage in indivisibles, making it possible for everyone to be served in equilibrium. Thus, the net effect of the factor market distortion in a transition economy could be an increase or decrease in indivisible good output. It is worth noting that the market economy equilibrium is Pareto optimal even with consumption indivisibilities. Though less able agents are better off in a transition economy, the most able ones are worse off as price is higher while their incomes are unchanged.

3 The Transition Economy

We now turn to a full analysis of the transition economy. Let $w(Q)$ denote the wage needed to attract enough workers to produce Q units of the indivisible. Clearly, $w(Q)$ is an increasing function. An increase in output, and hence the wage, raises the average quality of labor decreasing the unit labor requirement

which is denoted by $z(Q)$. Let $c(Q)$ denote the unit cost of producing Q units. Since unit costs are the unit labor requirement times the wage, they could rise or fall in response to an increase in the wage rate. When the increase in $w(Q)$ just balances the fall in $z(Q)$, then $c(Q)$ will be constant, say, at c^T . We first characterize equilibrium for the constant cost case.¹³

3.1 Constant Costs

It is easy to show that costs are constant if and only if the ability distribution takes the constant elasticity form, $F(\gamma) = \gamma^\theta$.¹⁴ It is easy to verify that costs are constant for this case. Conversely, if costs are constant, then they equal the wage bill divided by the output level at that wage:

$$c^T = \frac{wF(w)}{\alpha \int_0^w \gamma f(\gamma) d\gamma}.$$

Differentiating the above and rearranging terms yields:

$$(c^T \alpha - 1) w f(w) = F(w)$$

or

$$\frac{d \ln F(w)}{d \ln w} = \frac{1}{(c^T \alpha - 1)}.$$

Consequently, $F(w) = w^\theta$, where $\theta = \frac{1}{(c^T \alpha - 1)}$.¹⁵

¹³With constant costs, no firm gains from offering a higher wage in order to attract more able workers. So, we assume, they choose not to do so.

¹⁴Since $F(\cdot)$ is a distribution function, $\theta > 0$. Note that the uniform distribution corresponds to $\theta = 1$.

¹⁵The constant of integration equals 0 as $F(0) = 0$.

3.1.1 Autarky

Let $\bar{w} = w(1)$ be the wage needed to elicit the labor required to produce an output of unity. Let $Q^* = 1 - F(c^T) < 1$ and let $w^* = w(Q^*)$. Since attracting more labor requires a higher wage, \bar{w} must always exceed w^* .

Proposition 1: The autarky equilibrium output in a transition economy, denoted by $Q^T(\alpha, \theta)$, is

$$\begin{aligned} Q^T(\alpha, \theta) &= 0 && \text{for } \alpha < \frac{1+\theta}{\theta} \\ &= \begin{cases} 1 - \left(\frac{1+\theta}{\alpha\theta}\right)^\theta & \text{for } \frac{1+\theta}{\theta} \leq \alpha < \left(\frac{1+\theta}{\theta}\right) 2^{\frac{1}{\theta}} \\ 1 & \text{for } \alpha \geq \left(\frac{1+\theta}{\theta}\right) 2^{\frac{1}{\theta}}. \end{cases} \end{aligned}$$

Proof. Since $\bar{w} > w^*$, there are only three possible rankings of c^T , \bar{w} , and w^* :

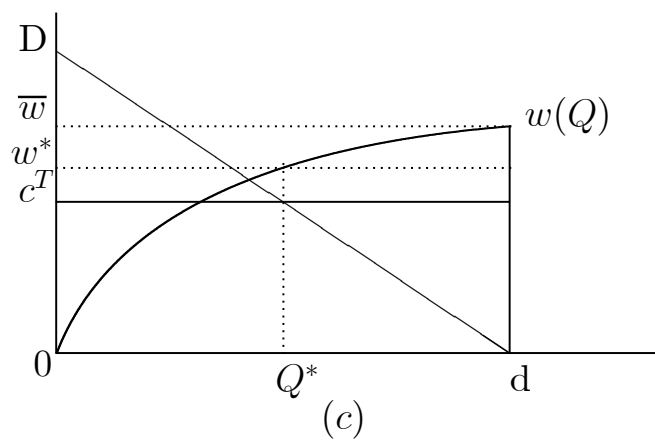
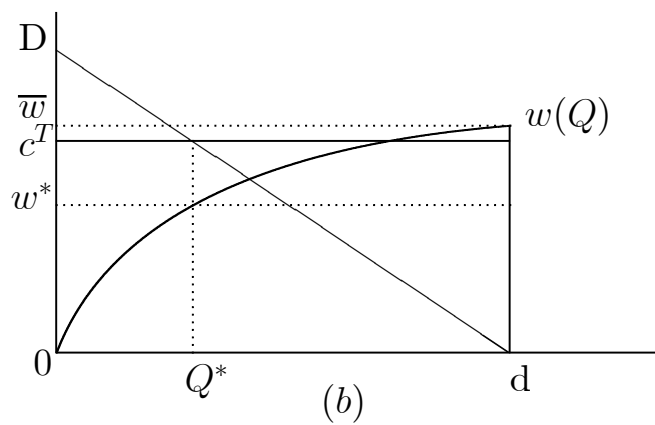
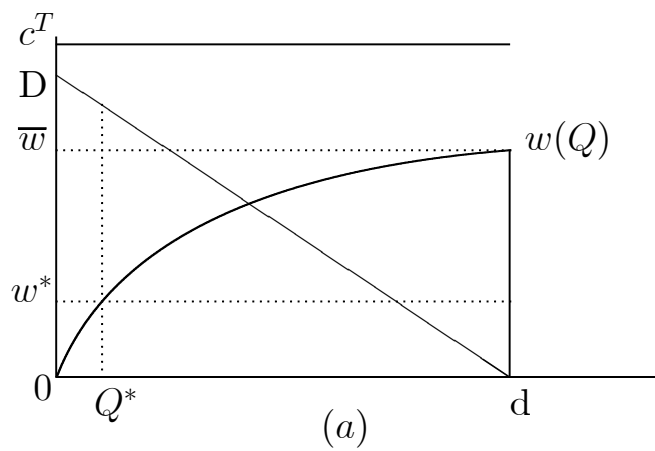
$$(a) c^T > \bar{w} > w^*, \quad (b) \bar{w} \geq c^T > w^*, \quad \text{or} \quad (c) \bar{w} > w^* \geq c^T. \quad (1)$$

It is easy to verify that $w^* = (c^T)^{1/1+\theta}(1 - (c^T)^\theta)^{1/1+\theta}$, $c^T = \frac{1+\theta}{\alpha\theta}$ and $\bar{w} = (c^T)^{1/(1+\theta)}$. Hence, (1) is equivalent to

$$(a) \alpha < \frac{1+\theta}{\theta}, \quad (b) \frac{1+\theta}{\theta} \leq \alpha \leq \left(\frac{1+\theta}{\theta}\right) 2^{\frac{1}{\theta}}, \quad \text{or} \quad (c) \alpha > \left(\frac{1+\theta}{\theta}\right) 2^{\frac{1}{\theta}}. \quad (2)$$

Case (a) is depicted in Figure 2(a). Since $\theta > 0$, if $c^T > \bar{w}$, then $c^T > 1$. As a result, even the most able cannot afford the indivisible good and indivisibles will not be produced in equilibrium so that $Q^T(\alpha, \theta) = 0$. Case (c) is depicted in Figure 2(c). Since demand is unity even at a wage of w^* , serving the entire

Figure 2: Equilibria in a Transition Economy



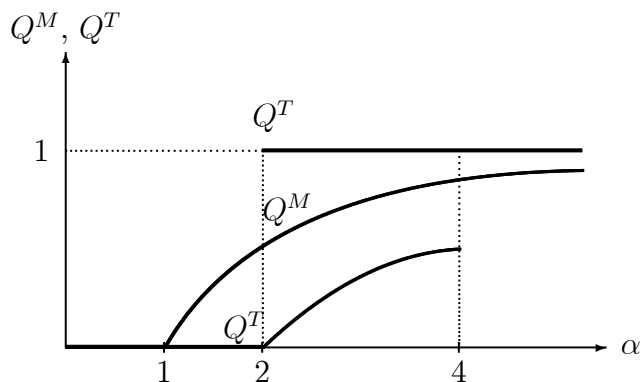
market is the unique equilibrium so that $Q^T(\alpha, \theta) = 1$. Case (b) is depicted in Figure 2(b). Here there are two equilibria. If the entire market is served, then wages are above cost so that this is an equilibrium with $Q^T(\alpha, \theta) = 1$. If only part of the market is served, then wages are below cost so that this is also an equilibrium and $Q^T(\alpha, \theta) = 1 - \left(\frac{1+\theta}{\alpha\theta}\right)^\theta$.¹⁶ ■

>From Lemma 1, we know that costs in a transition economy exceed those in a market economy. Therefore, less productive transition economies will not have a viable indivisible sector while their market economy counterparts will. When productivity in indivisibles is high enough, everyone must be served in a transition economy, and hence output must exceed that in a market economy. Output comparisons can go either way for intermediate productivity levels. Output in the transition and market economy when $\theta = 1$ is depicted in Figure 3.

What are the welfare consequences of this pattern of output? For an economy with $\alpha < \frac{1+\theta}{\theta}$, the equilibrium in a transition economy is Pareto inferior to that in the corresponding market one since indivisibles are not produced at all in the former. Costs are prohibitively high in the transition economy so there is no increase in the wage of the less able to offset the higher costs, and hence price, of a transition economy. For an economy with $\alpha \geq \left(\frac{1+\theta}{\theta}\right) 2^{\frac{1}{\theta}}$, utilitarian social welfare must rise if V is large enough although

¹⁶Notice that there is an additional unstable equilibrium which involves rationing in the market for indivisibles. Let \hat{Q} be defined by $c(\hat{Q}) = w(\hat{Q})$. The equilibrium involves producing \hat{Q} and pricing at cost. However, the equilibrium is unstable: if more was produced wages would rise and it would be demanded at a price that covered cost.

Figure 3: Output of Indivisibles in Autarky



the most able lose since costs and price are higher in a transition economy. In between, the least able gain while the most able lose in both the part and all served equilibrium.

3.1.2 Trade

By Lemma 1, $c^T > c = \frac{1}{\alpha}$. Given constant costs and perfect competition, the country with the lowest cost exports the indivisible. In this manner, differences in institutions may dictate comparative advantage and create a basis for trade.¹⁷ Hence, better technology need not confer comparative advantage.

When autarky prices differ, the trade price must lie between them.¹⁸

¹⁷In a similar vein, Chichilnisky (1994) provides a model where the basis of trade is the differences in environmental standards.

¹⁸A price outside this range would result in both countries specializing in the same good and none of the other good being made. However, this cannot be an equilibrium as both

With constant costs, at least one country must specialize as in the standard Ricardian model. In a market economy, standard beneficial price effects occur, and trade results in a Pareto improvement. In a transition economy, trade affects not only prices, but also the distribution of income through its effect on the wage in indivisibles, which is directly related to the output of indivisibles.

Unlike the standard Ricardian model, trade does not affect all agents in the same way. For example, if the transition economy specializes in divisibles, as it would if the price of the indivisible fell, then the wage in indivisibles will be zero. The least able lose as their real income falls, while the more able gain due to the fall in price, which raises their real income.

An unusual result obtains for a large transition economy which produces both goods, but exports the divisible good.

Proposition 2 *Trade must result in a Pareto inferior outcome for a large transition economy which imports indivisibles.*

Proof: *For a large economy, by definition, there are no price effects due to trade. Importing the indivisible must reduce the production of the indivisible, and hence the wage in indivisibles. This adverse income effect, with no price effect, yields a Pareto inferior outcome.*

goods are demanded in equilibrium. In the undistorted economy, for example, all but the agent with income exactly equal to price would demand some of the divisible good, while agents with a higher income would also demand the indivisible good. Since cost is positive but below unity by assumption, so is price so that agents with income above and below costs always exist, at least in the undistorted economy.

3.2 Transition Economy with Non Constant Costs

So far we have restricted attention to the constant cost scenario where an increase in wage offered resulted in a proportionate improvement in the productivity of workers attracted to the sector. As a result, firms had no reason to offer higher wages. We now show that the spirit of our results carries over when costs are not constant.

Recall that $c(Q)$ denotes the unit cost in indivisibles and $z(Q)$ denote the unit labor requirement there.

Lemma 2: *Unit costs in a transition economy, $c(Q)$, can intersect $w(Q)$ at most once.*

Proof: *As Q rises, the percentage increase in $w(Q)$ must exceed that of $c(Q)$ since $c(Q) = w(Q)z(Q)$ and $z(Q)$ falls with output. Thus, if the two intersect, $w(Q)$ must be rising faster than $c(Q)$. If there is one intersection, then there cannot be another one: since both are continuous, $w(Q)$ would have to intersect $c(Q)$ from above, which is impossible.*

With increasing costs there is no incentive for firms to offer higher wages to attract a better quality work force. Thus we have the same cases as depicted in Figure 2 except that $c(Q)$ is upward sloping.

Proposition 3: *If costs are increasing, then the autarky equilibrium is similar to that in Proposition 1.*

Proof: *As shown in Lemma 2, $c(Q)$ can intersect $w(Q)$ at most once and such an intersection must be from below. Hence, there are three mutually exclusive and exhaustive cases, which correspond to the three cases in Proposition 1. (a) $c(Q)$ and $w(Q)$ do not intersect in the interval $[0, 1]$. (b) They intersect in the interval $(Q^*, 1]$. (c) They intersect in the interval $(0, Q^*]$. In case (a), $w(1) < c(1)$ so that the only equilibrium is the part served one. In case (c), $c(1) < w(1)$ and $c(Q^*) \leq w(Q^*)$ so the only equilibrium is the all served one. In case (b), $c(1) \leq w(1)$ and $c(Q^*) > w(Q^*)$ so that both all served and part served are equilibria.*

If costs are decreasing in output, then firms have an incentive to raise wages above $w(Q)$, the level required to attract the labor needed. If costs fall monotonically with output, offering a wage of unity will minimize costs. At this wage, all workers will prefer to be employed in indivisibles, and firms will have to ration employment. Although this results in job queues, no firm has an incentive to lower its wage offerings as this will result in a decrease in the average productivity of workers hired. Similarly, no worker would volunteer for a lower wage as this would signal that the worker is of low productivity. This labor market rationing arising from adverse selection resembles that in Weiss (1980).

Rationing in the labor market alters the demand for indivisibles. All workers in indivisibles will earn a wage of unity. This creates a horizontal segment at unity for market demand, as depicted by the segment AD in

Figure 4: Rationing in the Labor Market

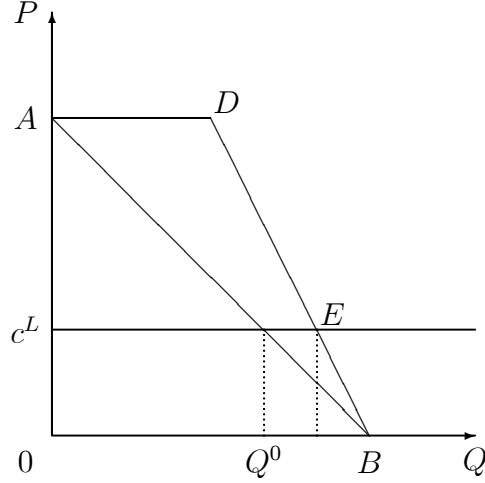


Figure 4. The length of this segment depends on the output of, and hence the labor force used in, indivisibles. The larger the output, the longer this segment will be. We assume that if there is rationing in the labor market, then all workers have an equal probability of employment and that rationed workers are employed in divisibles. Hence the segment AD connects to the point B as in Figure 4.¹⁹ Market demand for any given level of employment in indivisibles is given by the intersection of ADB and the cost of production at a wage of unity, denoted by c^L .²⁰

Proposition 4: *If costs are decreasing, and the indivisible goods sector is viable, then there is a unique equilibrium in indivisibles, and serving*

¹⁹Note that although AB and DB are drawn as straight lines for simplicity, they will not have constant slopes since costs are not constant.

²⁰Note that $c^L = \frac{1}{\alpha E(\gamma)}$ where $E(\gamma)$ denotes average ability. For the indivisible good sector to be viable, c^L must be less than unity, i.e. $\alpha E(\gamma) > 1$.

everyone is no longer an equilibrium. In addition, there must be rationing in the labor market.

Proof: *Let $\Delta(Q)$ denote demand when output is Q . Consistency requires that in equilibrium the demand generated for indivisibles equals its output, i.e., $\Delta(Q) = Q$. There is a unique equilibrium level of output at which this occurs. The proof uses standard fixed-point arguments. Demand for indivisibles rises with its output, i.e., $\Delta'(Q) > 0$. If $Q = 0$, then demand would be $\Delta(0) = Q^0 > 0$ as depicted in Figure 4. If $Q = 1$, then $\Delta(1) < 1$ since all workers are not needed to produce a unit of indivisibles. Hence, some workers are rationed. Thus, there is a unique output level such that $\Delta(Q) = Q$.*

With monotonically decreasing costs, the equilibrium wage is unity and all individuals like to work in indivisibles, but not all are needed. As a result, the equilibrium has to involve rationing in the labor market.

Trade has the same kind of effects as before. Whether costs are increasing or decreasing, the same forces, via price and the distribution of income, come into play. The only additional feature is that if costs are decreasing, exporting indivisibles may also serve to reduce rationing in the labor market.²¹

²¹Non monotonicity of costs can add further complications. It may be that rationing occurs in the product market as well as the labor market, and that there are two kinds of firms: one kind offers a low wage and hires all workers who come to it, while the other kind rations employment at a higher wage.

4 Distortion in the Divisibles Sector

When the factor market distortion is in divisibles, complementarities exist between the production of divisibles and the demand for indivisibles, rather than between the production and demand for indivisibles as in a transition economy. Such an economy can be interpreted as a traditional developing economy where divisibles are the traditional sector, agriculture, which is organized on the basis of family farms where workers share output equally.²²

Workers in divisibles earn the average product there. As a result, more able workers work in indivisibles while the less able remain in divisibles.²³ As in the transition economy the marginal worker in divisibles is determined by the demand side. Let $a(Q)$ denote the average product of labor in divisibles as a function of the output in *indivisibles*. Clearly, $a(Q)$ is decreasing: as the output of indivisibles rises so does its demand for labor, which reduces the average product in the divisible good sector. In essence, $a(Q)$ plays the same role as $w(Q)$ in a transition economy: there is a horizontal segment in demand for indivisibles at the equilibrium value of $a(Q)$. In this economy, however, an increase in the output of indivisibles affects its demand adversely, and as a result multiple equilibria are absent.

²²We assume that the agricultural sector is one big family farm that produces the divisible good. This allows us to abstract from asymmetries and integer problems in family size, farm size, and member ability. An alternative interpretation would involve identical family farms, each with a continuum of members.

²³Unlike the usual assumption in the disguised unemployment literature, the average product of labor in agriculture *falls* as fewer people work on it. This does not need to be the case with a land constraint in agriculture as explained below.

When the factor market distortion is in divisibles, workers in divisibles are paid more than their marginal product in indivisibles, which reduces the relative cost of indivisibles relative to a market economy with the same technology. In this way, a factor market distortion in divisibles creates a comparative advantage in indivisibles. Since an increase in the output of indivisibles reduces the income of the least able and their ability to afford indivisibles, trade can easily reduce welfare if indivisibles are exported.

It is easy to construct examples of trade between a transition economy and a developing economy, which result in mutual losses from trade: all one has to do is ensure technologies differ so that the transition economy has a slightly higher cost per unit of output. Since the developing economy has a comparative advantage in indivisibles and exports them, the income effects for both countries are adverse. Since price effects are negligible by construction, both countries will lose from trade.

In our Ricardian setting, labor is the only scarce factor, and its productivity does not depend on the size of the labor force employed.²⁴ Land constraints can be incorporated most simply by assuming that there are external diseconomies of scale in the divisible good sector: as labor used in divisibles rises, productivity of labor in divisibles falls. This reduces the opportunity cost of labor and hence the unit cost of indivisibles.

²⁴This may not be such an unrealistic assumption in land rich countries such as the U.S. or Australia in the past century. However, especially in land-poor developing countries, having fewer people in agriculture (divisibles) raises the average productivity of labor.

Now, producing more of the indivisible good absorbs labor from the divisible good sector raising productivity there, and hence labor earnings. If land constraints are severe enough, exporting indivisibles raises social welfare through this channel.²⁵ In contrast, in the absence of land constraints, importing the indivisible good will raise the average ability of workers in divisibles and raise their earnings so that a developing economy would gain from importing indivisibles. This casts some light on why some developing economies gain through trade while others do not.²⁶

Proposition 5 *A factor market distortion in divisibles reduces the cost of producing indivisibles. Exporting indivisibles may reduce welfare due to adverse income effects. However, tight land constraints can outweigh the adverse income effects of exporting indivisibles.*

Proof: *See Krishna and Yavas (2002).*

5 Conclusion

We argued that labor market distortions coupled with indivisibilities in consumption can make losses from trade large and likely. Trade without structural reform could have serious adverse effects.

²⁵For details see Krishna and Yavas (2002).

²⁶For other explanations of such differences, see Krueger (1984) and Ray (1998).

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