

# **Local Import Competition in a Lumpy Country**

**Alan V. Deardorff**

**The University of Michigan**

Paper prepared for a festschrift honoring Richard Brecher  
and presented at the conference  
*Economic Integration and Economic Growth*, Seattle, WA,  
May 28-29, 2016

May 11, 2016

## ABSTRACT

### Local Import Competition in a Lumpy Country

Alan V. Deardorff

The University of Michigan

This paper examines the effects of a fall in the price of an imported good in a region of a country that is specialized in producing that good. The context is a “lumpy country” model in which factors are unable to move between locations, although in this case I assume that only labor is immobile, and that the other factor, capital, is perfectly mobile between regions. With mobile capital, the lumpy-country equilibrium can be anywhere in the factor-price equalization set, but my focus is on a region that initially produces only one good, on the border of that set. When the price of that good falls due to import competition, it would be possible for both factors to reallocate partially into production of the other good, but I assume instead that some capital simply leaves the region, so that it continues to produce only the same good that it did before. The result of this is a fall in the real wage of labor, just as under Stolper-Samuelson assumptions. I then look at production also of a non-traded good, and find that the same import competition that cheapened the traded good also cheapens the nontraded good. The result is that the region shrinks, losing capital and producing less of both goods unless the substitution in favor of the nontraded good expands its consumption out of a smaller income.

**Keywords:** Import competition  
Lumpy country

**JEL Subject Code:** F1 Trade  
F11 Neoclassical Trade Models  
F2 Factor Movements

**Correspondence:**

Alan V. Deardorff  
Ford School of Public Policy  
University of Michigan  
Ann Arbor, MI 48109-3091

Tel. 734-764-6817  
Fax. 734-763-9181  
E-mail: [alandear@umich.edu](mailto:alandear@umich.edu)  
<http://www-personal.umich.edu/~alandear/>

May 11, 2016

## **Local Import Competition in a Lumpy Country<sup>\*</sup>**

**Alan V. Deardorff**  
**The University of Michigan**

Looking back at the research contributions of Richard Brecher, I see consistent attention to effects on labor.<sup>1</sup> This resonates readily with recent empirical contributions such as Autor, Dorn, and Hanson (2013) whose work has showed us that the effects of imports on local labor markets are more severe and longer lasting than many of us in the trade field might have thought, and hoped. This has prompted me, in this paper, to consider the effects of a fall in the price of imports on a location within a country where labor finds it difficult to move to another part of the country where demand for labor may be expanding.

Since labor immobility within a country may lead to regions of a country having different wages, I reconsider the framework of “lumpy countries” that Paul Courant and I wrote about some years ago, in Courant and Deardorff (1992, 1993). However, my focus here will be somewhat different, in that I will assume that it is only labor that is immobile, and I will let capital be perfectly mobile between both locations and industries. This mobility of capital is consistent with the capital being owned by people who are not local residents, so that part of the income generated within a locality will not be spent

---

<sup>\*</sup> I have benefited over the years from reading the contributions of Richard Brecher, and I am pleased to be able to contribute this paper in his honor.

<sup>1</sup> See for example Brecher (1974), Brecher, Chen, and Choudhri (2002), and Brecher and Chen (2010).

there. This too is reminiscent of work that Richard Brecher has done on foreign-owned factors<sup>2</sup>, albeit mine may well be located elsewhere in the same country.

I will look first at factor allocations to two regions of a two-factor, two-sector economy, as in Courant and Deardorff (1992). There, however, the attention was on how the trade pattern of the country would depend on those allocations. Here my concern is with a small region that is initially specialized in producing only the labor-intensive good and what will happen to it when the price of that good falls due to import competition.

Next I will focus only on such a region, but now allow it to produce a nontraded good in addition to the traded labor-intensive one. Import competition now has implications for the price of that nontraded good, the size of that implication depending on the relative factor intensity of the nontraded good relative to the traded one.

Finally, I will look briefly at what the overall economy of the small region will look like before and after the import competition. It is here that the assumption of foreign-owned capital plays a role, since any increased income of capital in the region is not spent there.

### ***The Lumpy Country***

Figure 1 shows the allocations of two factors,  $K$  and  $L$ , to two regions,  $A$  and  $B$ , which they can in turn allocate to production in two tradable industries, labor-intensive  $X$  and capital-intensive  $Y$ . My assumption throughout will be that region  $A$  is very small compared to  $B$ , although I don't show it that way in Figure 1 for ease of seeing it. The country faces given prices for the goods,  $p_X$  and  $p_Y$ , on world markets and it levies no tariffs. Based on those prices, the usual mechanics of the Heckscher-Ohlin model

---

<sup>2</sup> See Brecher and Bhagwati (1981).

(without factor-intensity reversals) lead to unique capital-labor ratios,  $k_X$  and  $k_Y$ , for the two industries if both goods are produced.

The box in the figure has dimensions equal to the country's total endowments of labor and capital. The allocations to Region  $A$  are measured from the lower left, and those to the larger region  $B$  from the upper right. The capital labor ratios  $k_X$  and  $k_Y$ , drawn from these two corners as shown, delineate the FPE parallelogram within which the two regions share the same prices of factors as each other and the world (if the world has these same technologies).

Suppose that Region  $A$  has the amount of labor shown as  $L^A$ . What it will do depends on its capital. If it has enough capital to lie within the FPE set, as at point  $E^2$ , then it will produce both goods using the factors shown as the two (green) dotted arrows. If instead it has enough less capital to lie outside the FPE set as at point  $E^1$ , then it will produce only good  $X$  using the factors shown by the (red) dashed arrow. In this latter case it will not share the factor prices of Region  $B$ , but will have a higher rental on capital and a lower wage of labor, as could be seen by inserting appropriate isoquants for good  $X$ .

My assumption, however, will not be that Region  $A$ 's allocation of capital is fixed, only its allocation of labor. Thus, were it to somehow start at point  $E^1$ , the higher rental on capital than in Region  $B$  would attract capital to relocate into  $A$  until rentals would be equalized. Thus my assumption from here on will be that Region  $A$  starts on the border of the FPE set, at  $E^0$ , sharing factor prices with Region  $B$  but producing only the labor-intensive good  $X$ . Note that the allocation of capital to Region  $A$  is otherwise indeterminate, as it could equally well host more capital than at  $E^0$ , and even have enough

to specialize completely in good  $Y$ . My interest, however, is in a region that specializes in the labor-intensive good, since that is the one for which I will consider increased import competition.

Increased import competition will enter the model through a fall in the exogenous price of the labor-intensive good,  $X$ . As usual in the Heckscher-Ohlin model and as could be verified with a Lerner Diagram, this fall in price will cause a change in the factor prices consistent with producing both goods. The rental price of capital will rise and the wage of labor will fall, the latter more than in proportion to the fall in price, as we know from the Stolper and Samuelson (1939). This fall in the wage-rental ratio will reduce both  $k_X$  and  $k_Y$ , rotating their lines in Figure 1 clockwise and repositioning the FPE parallelogram. I will not draw all of that, since my concern is only with what happens to Region  $A$ , in the lower-left of the figure. This is shown in Figure 2.

The region starts with endowment  $E^0$ , producing only good  $X$ . The immediate effect, if capital does not move and does not change what it produces, is a fall in both the return to capital and the wage by the same percentage as the fall in price of good  $X$ . But this is not an equilibrium and cannot last.

Since we are now in the interior of the new FPE set, multiple equilibria are possible. One, shown by the (green) dotted arrows, is for both labor and capital in Region  $A$  to move out of industry  $X$  and into industry  $Y$ . Another is for capital to leave Region  $A$  completely and move elsewhere. I am formally allowing it to move only to Region  $B$ , but it could just as well move out of the country. In either case, all of Region  $A$ 's labor would then continue to be employed in industry  $X$ , but with less capital to work

with it would produce less. This is shown by the (red) dashed arrow in Figure 2. Note that in either case, the wage of labor falls further, to that predicted by Stolper-Samuelson.

Another possibility that one might consider would be that downward wage rigidity prevents the wage from falling at all, as Richard Brecher has explored in several papers. I will leave that to him to consider if he wishes.

Which of the two possibilities occurs – the allocation to Region  $A$  staying at  $E^0$  and both factors transitioning to industry  $Y$ , or capital leaving Region  $A$  so that the allocation moves to  $E^1$  – this model cannot tell us, as both (and more) lie within the range of indeterminacy. But stepping outside the model, I would say that the second is more likely. If one were to expand the model to include costs of moving from one equilibrium to another, it seems likely that these costs, even if very small, would favor the capital outflow.

This, then, is what I will say that the lumpy country model predicts for the effects of increased competition from imports of the labor intensive good. Those localities within the country that have specialized in producing the labor intensive good will continue to do so, but their wages will fall and a portion of their capital will depart. This is a new equilibrium that need not ever be reversed if the price change is sustained.

### ***Adding a Nontraded Good***

Let me now assume that in addition to traded goods  $X$  and  $Y$ , there is a third nontraded good  $Z$ , also produced from capital and labor. I will continue to assume that capital is freely mobile between the region and the rest of the country and perhaps the world, and

that it is owned outside of Region  $A$ . For the reasons already discussed, Region  $A$  does not produce traded good  $Y$ , but only  $X$  and  $Z$ .

Figure 3 provides a Lerner diagram to show the determination of the region's wage and also its price of good  $Z$ . Given to the region are the price of good  $X$ ,  $p_X^0$ , and the rental price of capital,  $r$ . The latter determines the vertical intercept of the initial unit isocost line, as shown. The price of  $X$  determines the  $X$  industry's unit-value isoquant,  $X=1/p_X^0$ , to which the unit isocost line must be tangent. This then determines the equilibrium initial wage,  $w^0$ , the reciprocal of which is shown as the horizontal intercept of the isocost line. Finally, since good  $Z$  is not traded, its price must adjust so that a unit value of it costs one unit, and therefore its unit-value isoquant,  $Z=1/p_Z^0$ , must be tangent to the unit isocost line.

Now suppose that the price of good  $X$  falls to  $p_X^1 < p_X^0$ . This shifts the unit-value isoquant of  $X$  radially out from the origin by the percentage change in the price, to  $X=1/p_X^1$ , shown as a (red) dashed curve. Because of capital mobility, there can be no change in  $r$ , so the unit isocost line must rotate counter-clockwise around its vertical intercept until it is tangent to the new unit-value isoquant. This, then determines the new equilibrium wage,  $w^1$ , shown by the new horizontal intercept,  $1/w^1$ . This has moved to the right by a larger percentage than the outward shift of the  $X$  isoquant, implying that the wage has fallen more than the price and that therefore the real wage of labor in terms of both  $X$  and  $Y$  has fallen, as we know from Stolper-Samuelson.

With this fall in the wage, the price of the nontraded good must also fall, and that is found by shifting the unit-value isoquant of good  $Z$  also radially outward until it is tangent to the new isocost line. As drawn in Figure 3, the nontraded good is even more



labor-intensive than  $X$ , and therefore its price falls by more than  $p_X$ . In fact there may be many nontraded goods, some less and some more labor intensive than  $X$ . In that case, while all of their prices will fall, those less labor-intensive will fall by less than did  $p_X$ . Note that even the most labor-intensive possible nontraded good cannot fall in price by more than the wage, and therefore it remains the case that the real wage of labor has fallen in terms of all goods.

The conclusion from all of this, then, is that if a region is specialized in a single traded good, and if capital but not labor is mobile with the rest of the country, then increased import competition in that traded good will cause not only its price to fall but the prices of all the nontraded goods (many of which of course are services) in the region. And labor, even if it remains employed as this model assumes, is worse off throughout.

### ***Consumption***

Figure 4 shows the consumption possibilities of the region before and (in dashed-red) after the fall in price of good  $X$ . Consumption possibilities are not here anchored by a production possibility curve in the usual way, since production is constrained not by a quantity of capital but by the price that must be paid for it in units of traded good  $Y$ .

Rather than attempt to plot production possibilities under this assumption, I go directly to consumption, which is determined by the income of labor and what it will buy of each good. Thus the  $X$ ,  $Y$ , and  $Z$  intercepts of workers' initial budget plane are  $w^0L/p_X^0$ ,  $w^0L/p_Y^0$ , and  $w^0L/p_Z^0$ , as shown at the points marked  $\alpha$ ,  $\beta$ , and  $\gamma$  respectively.

As already seen, the effect of increased import competition that lowers the price of good  $X$  is to cause an even larger fall in the wage, to  $w^1$ , and a fall also in the price of

nontraded good  $Z$  that may be larger or smaller than the drop in  $p_X$  depending on the relative labor intensities of  $X$  and  $Z$ , but that is in any case smaller than the drop in  $w$ . Thus all three intercepts of the budget plan move in toward the origin, that on the  $Y$  axis by the full amount of the drop in  $w$  since  $p_Y$  has not changed, and by less than that along the  $X$  and  $Z$  axes.

In general, if all three goods are consumed, the preferences would appear as a family of indifference surfaces in 3-dimensional space. However, consistent with the assumption that this small region of the country specializes completely in a good mostly for export, it seems reasonable to go a step further and assume that it does not consume good  $X$  at all. In that case we can use two-dimensional indifference curves to indicate consumption, and that's what I show in Figure 4. Consumption moves from  $C^0$  to  $C^1$ , responding to the fact that the non-traded good falls in price by less than the wage to prompt some substitution towards it in consumption.

One might also ask how much the region produces and trades before and after the price change. This is harder to see than one might have thought, since in addition to exporting an amount of good  $X$  in exchange for what it consumes of  $Y$ , it must also produce additional  $X$  with which to pay the rental on the capital that is owned outside the region. How much of that is needed is not clear from Figure 4; suffice to say that production will lie somewhere in the  $X$ - $Z$  plane on a line parallel to the  $X$  axis from the foot of the perpendicular from the consumption point, as shown by the two dotted lines. Production will be on these lines somewhere to the left of where they cross the budget plane.

The main conclusion from all of this is simply that the import competition makes the region smaller in all respects. It is not just the import-competing industry that suffers in a region that is hit by import competition. The non-traded sector is also likely to shrink, unless the substitution effect of its lower relative price outweighs the drop in the wage.

### ***Conclusion***

This exercise has sought to work out the effects of an increase in import competition in a region of a country that is specialized in producing a good for export, under the assumption that labor is unable or unwilling to leave the region but that capital, owned outside the region, is free to relocate. Although the lumpy country model allows in general for departures from factor-price equalization, the assumption here of capital mobility prevents that. As a result, the main effect on the region's labor is the same as predicted by the Stolper-Samuelson theorem: the wage falls in real terms.

The model identified an indeterminacy in the equilibrium under these assumptions, to the extent that capital and labor might be able to change industries rather than locations. But assuming instead that all adjustment takes the form of capital departing the impacted region, we find that import competition does indeed cause such a capital outflow. This matters not only for the directly impacted tradable-good industry, but also for whatever nontraded production takes place in the region. That sector also experiences a fall in price and, unless substitution in its favor outweighs the reduced wages of its customers, a shrinkage in size.

## ***References***

- Autor, David H., David Dorn, and Gordon H. Hanson. 2013. "The China Syndrome: Local Labor Market Effects of Import Competition in the United States," *American Economic Review* 106(6), October, pp. 212-2168.
- Brecher, Richard A. 1974. "Minimum Wage Rates and the Pure Theory of International Trade," *Quarterly Journal of Economics* 88(1), February, pp. 98-116.
- Brecher, Richard A. and Jagdish Bhagwati. 1981. "Foreign Ownership and the Theory of Trade and Welfare," *Journal of Political Economy* 89(3), June, pp. 497-511.
- Brecher, Richard A. and Zhiqi Chen. 2010. "Unemployment of Skilled and Unskilled Labor in an Open Economy: International Trade, Migration, and Outsourcing," *Review of International Economics* 18(5), November, pp. 990-1000.
- Brecher, Richard A., Zhiqi Chen, and Ehsan U. Choudhri. 2002. "Unemployment and Growth in the Long Run: An Efficiency Wage Model with Optimal Savings," *International Economic Review* 43(3), August, pp. 875-894.
- Courant, Paul N. and Alan V. Deardorff. 1993. "Amenities, Nontraded Goods, and the Trade of Lumpy Countries," *Journal of Urban Economics* 34, pp. 299-317.
- Courant, Paul N. and Alan V. Deardorff. 1992. "International Trade with Lumpy Countries," *Journal of Political Economy* 100, February, pp. 198-210.
- Stolper, Wolfgang and Paul A. Samuelson. 1941. "Protection and Real Wages," *Review of Economic Studies* 9(1), November, pp. 58-73.

Figure 1  
Factor allocations in a lumpy country

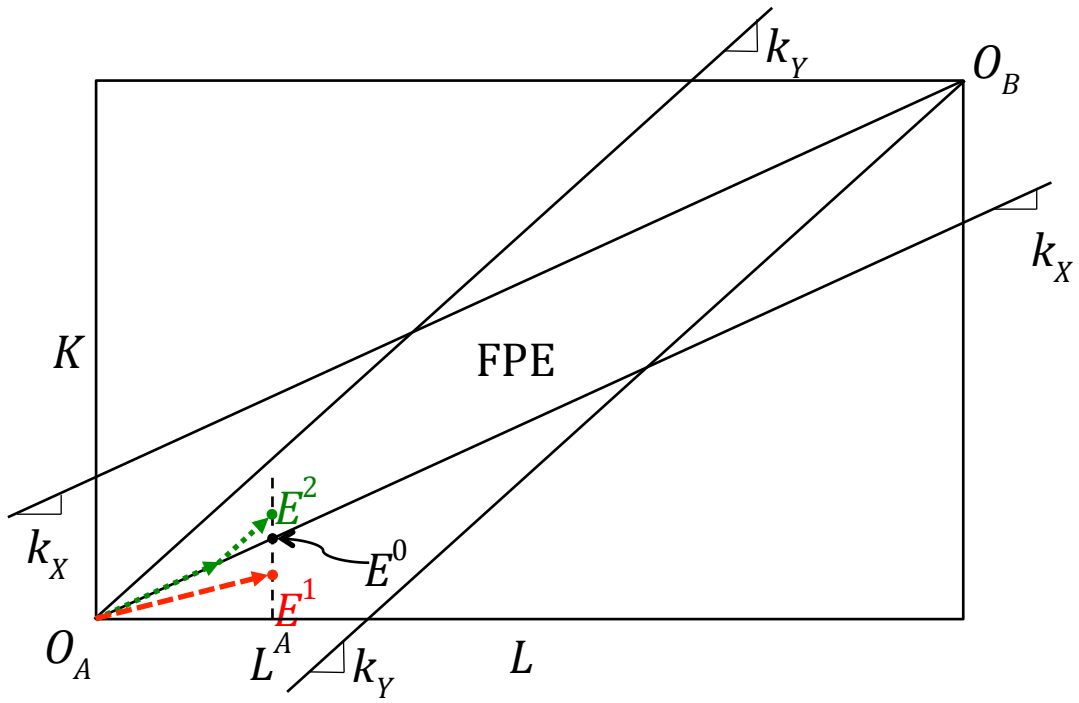


Figure 2  
Effects of a Fall in Price of Good  $X$

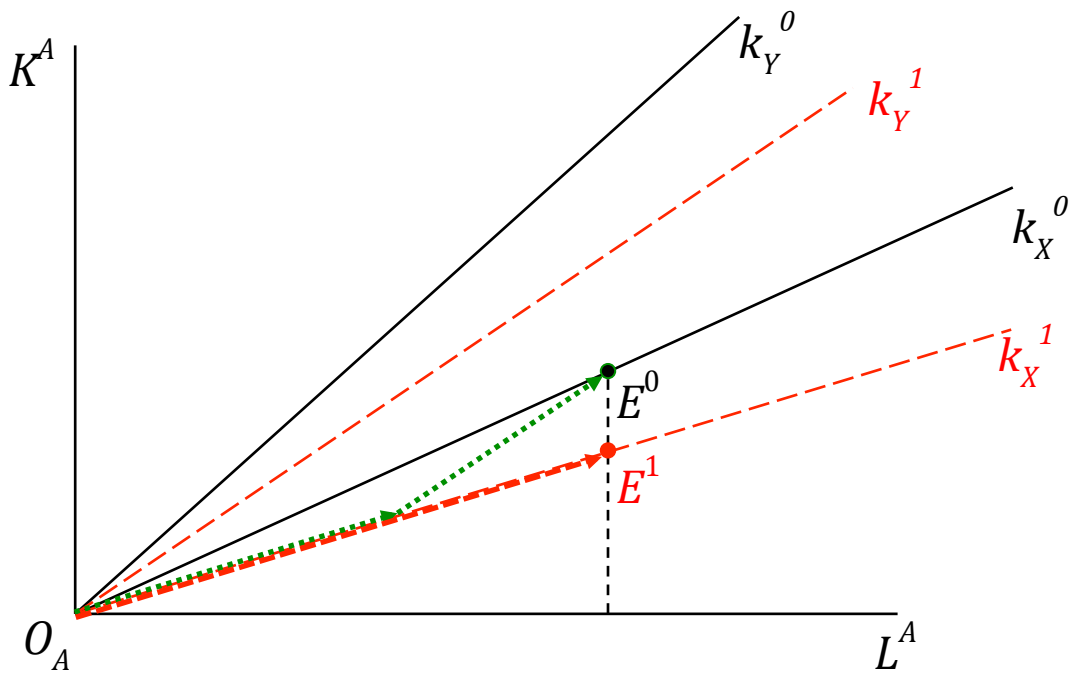


Figure 3  
Effects on Wage and Price of Nontraded Good, Z

