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The Welfare Effect of Changes in Factor Intensities

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Abstract

This paper attempts to show the welfare effect of changes in factor intensities. The standard two output-two input trade model is used. The welfare of a country could increase, decrease or remain constant after a change in the factor intensities of an industry. The outcome depends on the factor prices which prevail in the country when the change in factor intensities takes place.

It has been shown by Lizondo, Johnson and Yeh(1981) how changes in the factor intensities of industries affect the shape of the production possibility curve.[1] The purpose of this paper is to analyze geometrically how changes in the factor intensities of industries would affect the welfare of the country. The standard two factor, two output trade model will be used in this study. The factors are L(labor) and K(capital). The outputs are the capital intensive good X and the labor intensive good Y. All production functions are homogeneous of the first degree. It is also assumed that the country concerned is a small country so that it faces a given international output price line.

In Figure 1, TT is the initial production possibility Suppose that there is a decrease in the capital intensity of X industry. TT′ will be the new production possibility curve after the change in factor intensities.[2]

In Figure 2, x is an isoquant of the capital intensive good X. After the decrease in the capital intensity of X industry, x′ is the new isoquant representing the same amount of X as x. Isoquants x and x′ are tangent to line aa. Line aa is referred to as the "reference" factor price line. At the reference factor price ratio measured by line aa, the same amount of good X is produced with the same factor cost before and after the change in factor intensities. However, at any factor price ratio which is greater than

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1. Jose Saul Lizondo, Harry G. Johnson and Yeong-Her Yeh, Factor Intensities and the Shape of the Production Possibility Curve, *Economica*, May 1981, pp. 199~202.
2. Lizondo, Johnson and Yeh, op. cit., p. 201.

Figure 1.

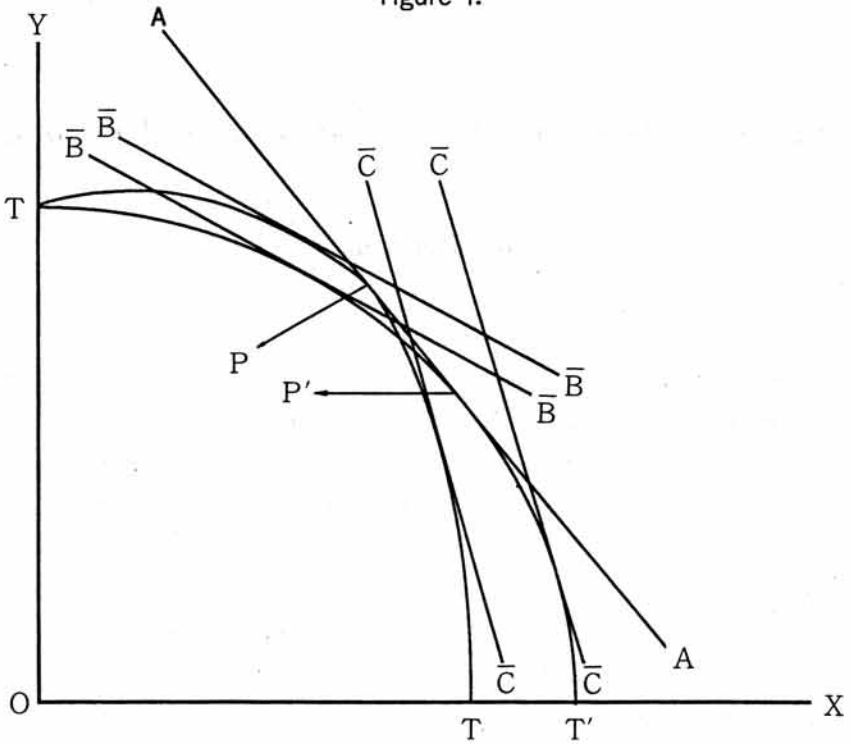
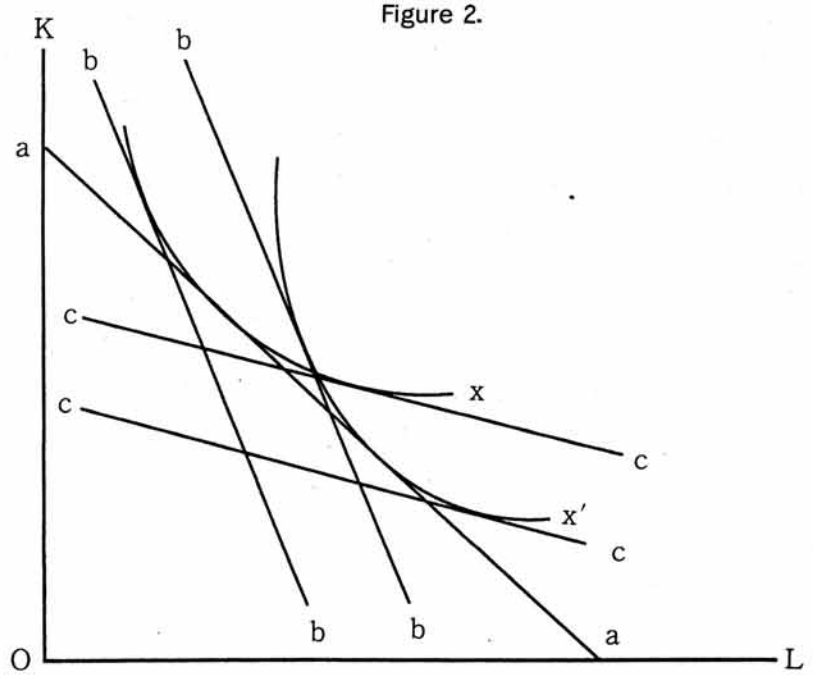


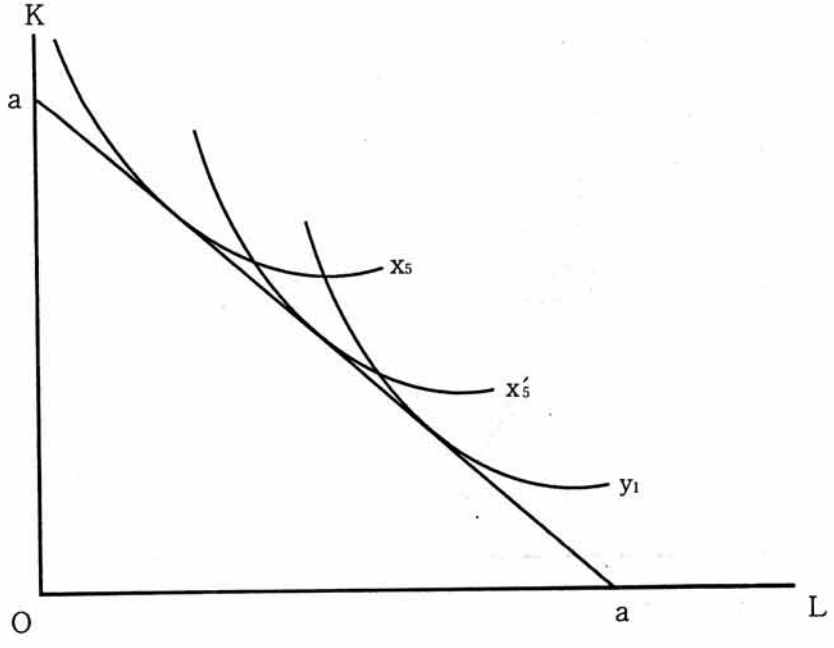
Figure 2.



the reference factor price ratio, the same amount of good X will be produced with a higher factor cost after the change in factor intensities(For example, x′ is tangent to a higher bb line than x). On the other hand, at any factpor price ratio which is less than the reference factor price ratio, the same amount of good X will be produced with a lower factor cost after the change in factro intensities(For example, x′ is tangent to a lower cc line than x).

Now examine how the change in factor intensities would affect the welfare of the country. First, suppose that the international output price ratio is 1Y=5X and that the factor price ratio corresponding to this international output price ratio is the reference factor price ratio. This is shown in Figure 3. In Figure 3, y_1 is an isoquant representing one unit of the labor intensive good X. Isoquants y_1 and x_5 are tangent to the reference factor price line aa. As shown in Figure 2, at the reference factor price ratio, the same amount of good X is produced with the same factor cost before and after the change in factor intensities. Therefore, x'_5 (the new isoquant representing five units of good X after the change in factor intensities) should be tangent to line aa. In this case, the welfare of the country will not be affected by the change in factor intensities, regardless of the pattern of trade. In Figure 1, the production possibility curves TT and TT′ will be

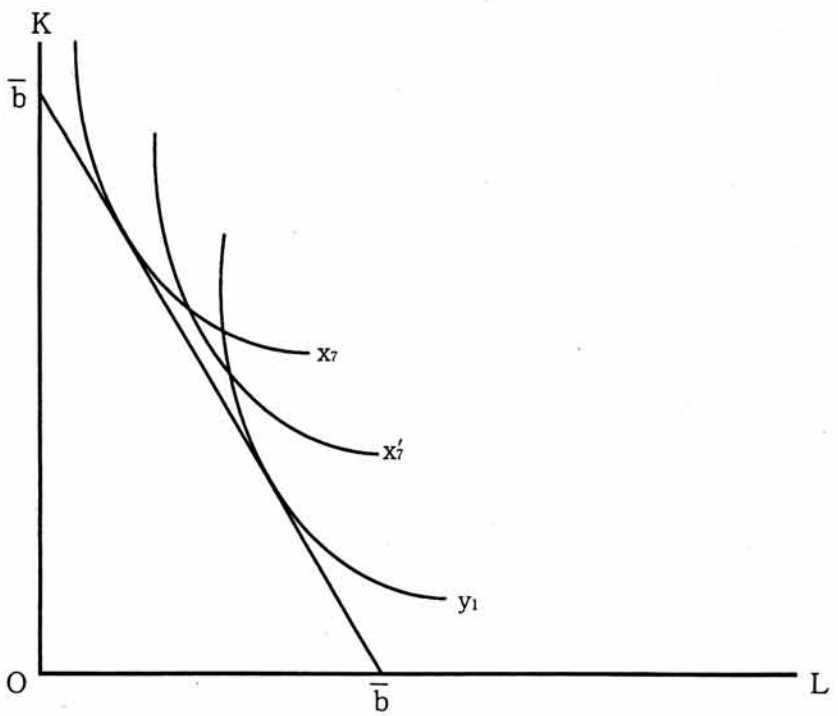
Figure 3.



tangent to the same output price line AA(which measures the output price ratio, 1Y=5X). The value of output is the same at P and P′ because each is equal to the value of the same set of factors at the reference factor price ratio.[3]

Next assume that the international output price ratio is 1Y=7X, which is measured by line $\overline{\overline{BB}}$ in Figure 1. Line $\overline{\overline{BB}}$ is less steep than line AA. TT′ will be tangent to a lower $\overline{\overline{BB}}$ line. In this case, the welfare of the country is decresased after the change in factor intensities, regardless of the pattern of trade. However, this means that the factor price ratio corresponding to this output price ratio is greater than the reference factor price ratio. This is shown in Figure 4. In Figure 4, isoquants y_1 and x_7 are tangent to the same factor price line $\overline{bb}$, which is steeper than the reference factor price line aa. As shown in Figure 2, if a factro price line is steeper than the reference factor price line aa, the same amount of good X would be produced with a higher factor cost after the change in factor intensities. The new isoquant x'_7 would be tangent to a higher bb line(not drawn).

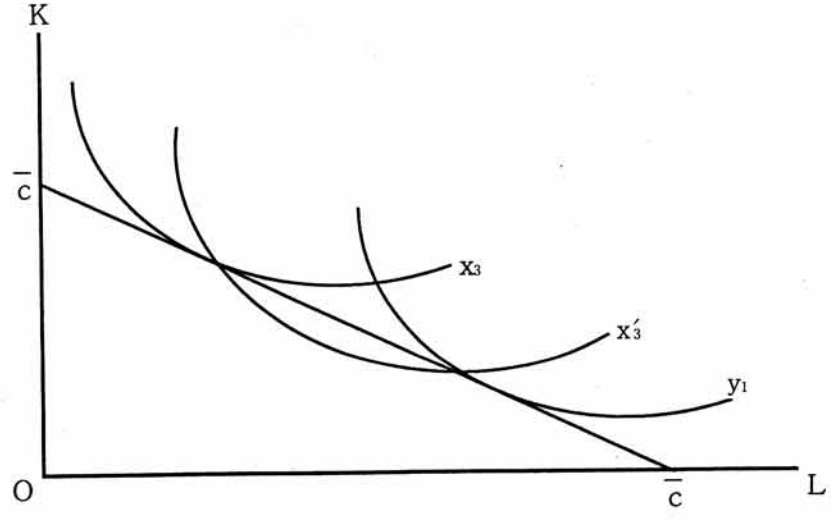
Figure 4.



3. Ibid.

Lastly, assume that the international output price ratio is 1Y=3X, which is measured by line $\overline{CC}$ in Figure 1. Line CC is steeper than line AA. TT′ will be tangent to a higher $\overline{CC}$ line. It is clear that the welfare of the country is increased after the change in factor intensities, regardless of the pattern of trade. However, this means that the factor price ratio corresponding to this output price ratio is less than the reference factor price ratio. This is shown in Figure 5. In Figure 5, isoquants y_1 and x_3 are tangent to the same factor price line $\overline{cc}$, which is less steep than the reference factor price line aa. As shown in Figure 2, if a factor price line is less steep than the reference factor price line aa, the same amount of good X would be produced with a lower factor cost after the change in factor intensities. The new isoquant x_3' would be tangent to a lower $\overline{cc}$ line (not drawn).

Figure 5.



We have analyzed above the welfare effect of a decrease in the capital intensity of the capital intensitive industry. This analysis can be applied to other cases, such as an increase in the capital intensity of the capital intensive industry, a decrease in the labor intensity of the labor intensive industry, etc. All of the results can be summarized as follows.

First, a change in the factor intensities of an industry will increase the welfare of the country if at the factor prices, which prevail in the country when the change in factor intensities takes place, the same amount of the output will be produced with a lower

factor cost after the change in factor intensities. Second, a change in the factor intensities of an industry will decrease the welfare of the country if at the factor prices, which prevail in the country when the change in factor intensities takes place, the same amount of the output will be produced with a higher factor cost after the change in factor intensities. Lastly, a change in the factor intensities of an industry will not affect the welfare of the country if at the factor prices, which prevail in the country when the change in factor intensities takes place, the same amount of the output will be produced with the same factor cost after the change in factor intensities.

References

Jose Saul Lizondo, Harry G. Johnson and Yeong-Her Yeh, "Factor Intensities and the Shape of the Possibility Curve", *Economica,* May 1981, pp. 199-202.