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(Citation)

神戸大学経済学研究科 Discussion Paper, 922

(Issue Date)

2010-03-08

(Resource Type)

technical report

(Version)

Version of Record

(URL)

<https://hdl.handle.net/20.500.14094/81001919>



# A Decomposition of Ricardian Trade Gains

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March 8, 2010

## Abstract

Teaching trade patterns and trade gains under the Ricardian trade model is one of the most difficult tasks for teachers of international economics. We propose that the utilization of both the PPF and a labor market graph makes the understanding of Ricardian trade gains much easier.

*JEL classification:* F10

*Keywords:* Trade Gains; Ricardian Trade Model; Graph of the Labor Market

## 1 Introduction

Teaching trade patterns and trade gains by using “Ricardian trade model” is one of the most important but difficult tasks for teachers of International Economics at the Principles level.<sup>1</sup> In most textbooks on international economics, the analysis of Ricardian trade gains relies solely on the utilization of Production Possibility Frontier (PPF) diagrams.<sup>2</sup>

In this note, we propose the use of a combination of the PPF graph and a labor market graph to facilitate the understanding of Ricardian trade gains. In addition, the inclusion of labor market graphs in the Ricardian Model lecture lays a useful groundwork for later lectures which deal with the Specific-Factors Model and International Factor Movements.

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<sup>1</sup>See Krugman (1993) on this point.

<sup>2</sup>See Appleyard, Field, and Cobb (2006), Caves, Frankel, and Jones (2002, ch. 5), and Krugman and Obstfeld (2008, ch. 3), for example.

## 2 Analysis

Consider a Ricardian economy which produces two goods (good 1 and good 2) with one factor of production, labor. Denote by  $a_{Li}$  the amount of labor needed to produce one unit of good  $i$ , and by  $y_i$  the output level of good  $i$ , respectively. Then the PPF is represented by

$$a_{L1}y_1 + a_{L2}y_2 = L, \quad (1)$$

where  $L$  is the total amount of labor. Figure 1 (a) depicts a linear PPF,  $VP$ , and the autarky equilibrium at  $A$ .

In autarky, the relative price of good 1 is determined by its opportunity cost:

$$\left(\frac{p_1}{p_2}\right)^A = \frac{a_{L1}}{a_{L2}}, \quad (2)$$

where superscript  $A$  represents the autarky equilibrium. Since prices are equal to labor costs, eq. (2) implies the equalization of wage rates between sectors.

$$\frac{p_1^A}{a_{L1}} = \frac{p_2^A}{a_{L2}}.$$

Now let us add one more panel for a better understanding: Figure 1 (b) depicts labor allocation between sectors. The horizontal axis represents the total labor force,  $L$ . The quantity of worker employed in sector 1 (resp. sector 2) is measured from the left (resp. right). The left (resp. right) vertical axis shows the wage rate in the sector 1 (resp. sector 2). Initially, in the autarky equilibrium, wage rates are equalized between sectors and  $O_1L$  workers are hired in sector 1, while  $LO_2$  workers are hired in sector 2. The total income (in terms of the numeraire, good 2) is shown by the shaded rectangle.

Now let us move to the trading situation with a fixed terms of trade (Figure 2). If the terms of trade are given by the slope of the line  $PD$ , the economy specializes in good 1 at point  $P$ . Assume that consumption occurs at point  $C$  located on the consumption possibility frontier  $PD$ , so that  $CBP$  is the trade triangle (the country exports  $BP$  units of good 1 and imports  $BC$  units of good 2).

Now we can decompose the movement toward the trading equilibrium into two steps, which is in line with the traditional separation of trade gains into consumption and production gains.<sup>3</sup> Firstly, suppose that in the short run, labor allocation is fixed, and thus the economy is staying at the autarky production point,  $A$ , while it is able to trade at the terms of trade  $p^T \equiv (p_1/p_2)^T$ . Superscript  $T$  denotes the trading equilibrium. Then, the consumption possibility frontier expands from  $VAP$  to  $V'AP$  as in Figure 2 (a). In Figure 2 (b), this change can be illustrated as an increase in the wage rate for the workers employed in sector 1 (i.e., from  $p_1^A/a_{L1}$  to  $p_1^T/a_{L1}$ ). Their total increase in wage

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<sup>3</sup>See, for example, Dixit and Norman (1980, pp. 71–72) and Maneschi (1998a, 1998b).

income is shown by the dotted rectangle in Panel (b), which is shown as  $VV'$  in Panel (a).

Next, let us consider the (long-run) labor movement between sectors. Since sector 1 offers the higher wage rate, workers will gradually move from the sector 2 to sector 1 (shown by the arrows in Figure 2). In Panel (b), the eventual distribution of labor force will be one with  $O_1O_2$  workers in sector 1, which corresponds to the production point  $P$  in Panel (a). The effect of this labor movement among sectors is shown as the expansion of the consumption possibility frontier from  $V'AP$  to  $DP$  in Panel (a), reflected by the horizontally shaded area in Panel (b). In terms of the numeraire, trade gains are measured by  $VD$  in Panel (a), and the sum of the dotted rectangle and the horizontally shaded rectangle in Panel (b).

### 3 Discussion

We believe that using the above illustration confers two major advantages. First, since the labor-market diagram emphasizes differences in wage rates between sectors in the short run, it is easier for students to understand the process of factor movements from the workers' perspectives. Furthermore, it is intuitive to see at first the trade gains in terms of labor income. This is later reinforced by the traditional separation of trade gains into consumption and production gains.

The second advantage relates to the sequencing of lectures of a typical course of International Economics (or International Trade). Since both the specific-factor model and the analysis of international factor movements make extensive use of the graphs of labor-market (dis)equilibrium, it might be helpful to provide a graph of the labor market in advance. The inclusion of labor market graphs in the Ricardian Model lecture lays a useful groundwork for the later lectures.

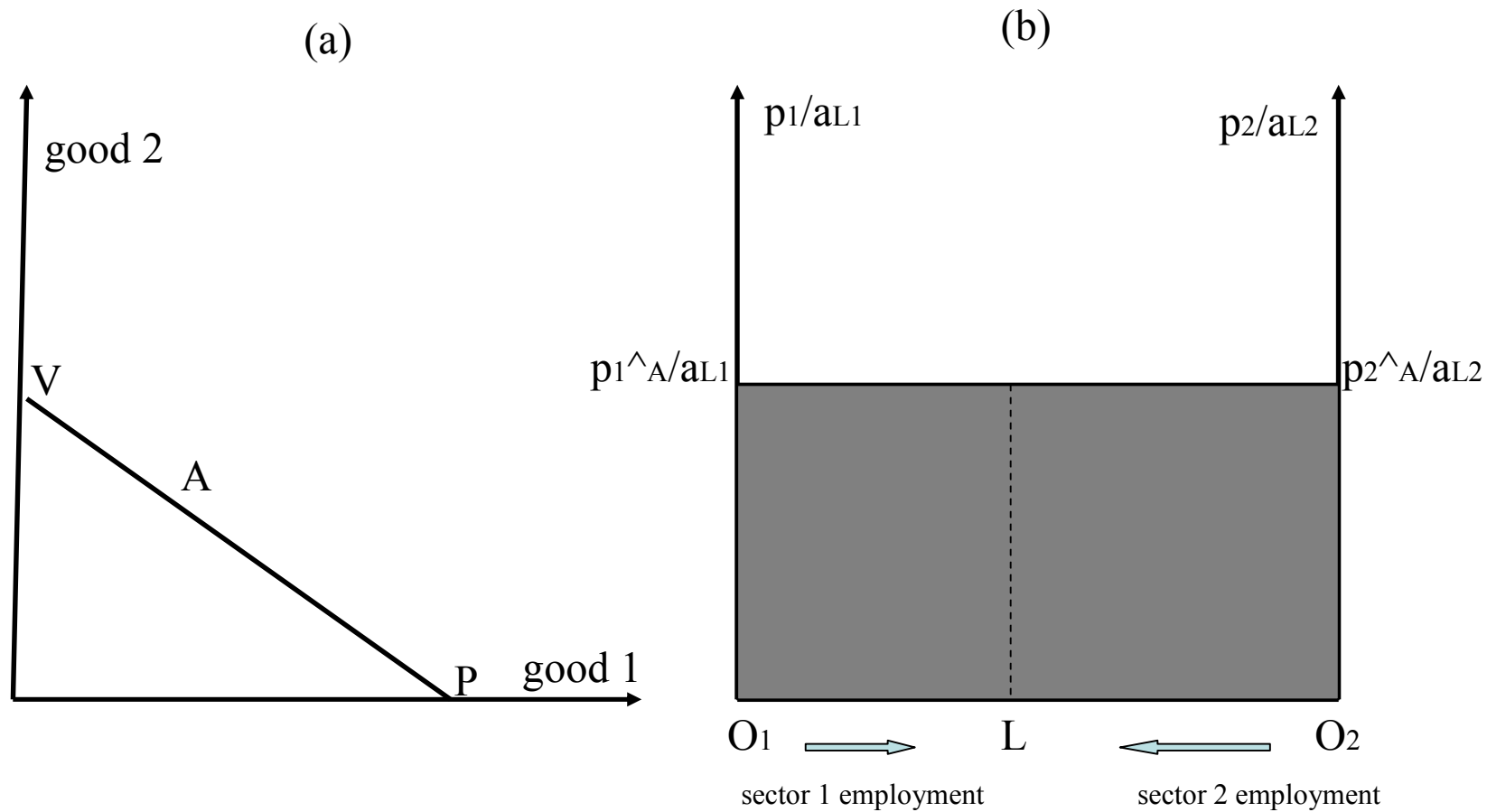
We recognize that there are many alternative ways to teach Ricardian trade gains and that what works well for one teacher and his/her students may not be attractive to others. Still, we believe that the way presented here provides some helpful tool for teaching Ricardian trade models.

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# Figure 1



# Figure 2

