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RESUMEN

¿Por qué la diferencia en salarios reales entre el primer mundo y el tercer mundo persiste después de tantos años de globalización rápida? El modelo standard neoclásico predice que los salarios reales se igualarán con el comercio, mientras que el modelo ricardiano no lo predice. Los hechos son así consistentes con el modelo ricardiano. Pero este modelo deja la distribución del ingreso indeterminada. El objetivo de este artículo es llenar ese vacío, mediante el desarrollo de un modelo ricardiano generalizado, en el cual la productividad laboral de los países es endógena y la desigualdad inicial de los países es exógena. El modelo es capaz de explicar las diferencias que observamos en productividad laboral, salario real y patrones del comercio entre países. Así, el modelo sugiere que la desigualdad inicial de las naciones juega un papel importante en la competencia internacional.

ABSTRACT

Why does the gap in real wage rates persist between the First World and the Third World after so many years of increasing globalization? The standard neoclassical trade model predicts that real wage rates will be equalized with international trade, whereas the standard Ricardian trade model does not. Facts are thus consistent with the Ricardian model. However, this model leaves undetermined income distribution. The objective of this paper is to fill this gap by developing a generalized Ricardian model, in which labor productivity levels across countries are endogenous and the initial inequality of countries is the exogenous variable. The model is able to explain the observed country differences in labor productivity levels, real wage rates, and patterns of trade. Thus, the model suggests that the initial inequality of countries plays a significant role in international competition.

Key words: international competition, labor productivity, real wage rate, initial inequality, income distribution, Ricardian trade model.
JEL: F10, F16, F66

INTERNATIONAL COMPETITION AND INEQUALITY: A GENERALIZED RICARDIAN MODEL[*]

Adolfo Figueroa[**]

Differences in real wage rates between the First World and the Third World is a feature of the capitalist system. How significant are these differences? Data on real wage rates by countries is scarce. ILO (2010) has recently published a data set that covers a large sample size of countries about minimum real wage rates only. Based on this source, Table 1 presents information for 90 capitalist countries of the world for 2009. We know that labor markets operate with scales of salaries and wages, in which the bottom of the scale refers to minimum wage rates, which apply mostly to low-skill workers. Assuming that relative market prices along the scale remain constant or do not change drastically, minimum wage rates can be a good indicator of the differences in the level of real wage rates between countries.

As can be seen in Table 1, differences in levels are very significant between the First World and the Third World, around six times. The gap with Latin America is only around three times, while with Africa is almost 10 times. This is just the reflection of the differences in levels within the Third World. Another feature of Table 1 is that minimum real wages in the First World countries are more homogenous (measured by the coefficient of variability, 0.24) compared to the Third World countries (0.75).

On the other hand, the US Bureau of Labor Statics reports hourly compensation costs of labor (including all types of workers—wages and salaries) in the manufacturing sector of several countries, measured in current US dollars. The last report corresponds to 2010, which includes data for 21 First World countries and only 8 for the Third World, and

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shows a wide dispersion: from 58 dollars in Norway, 35 dollars in the US, and 29 in the UK, down to 10 dollars in Brazil, 6 dollars in Mexico, and only 2 dollars in Philippines (BLS 2011, Table 3). The fact is that average labor costs are significantly higher in the First World compared to the Third World, as in the case of minimum wage rates.

The research question of this paper is: Why does the gap in real wage rates persist between the First World and the Third World after so many years of trade and increasing globalization? Globalization, measured by world trade/GDP, was 15% in 1985 and went up to 30% around 2005 (Docquier and Rapaport, 2012, Figure 1, p. 682).

The answer to a why question calls for theory. The standard trade literature has two theories with different answers. Neoclassical and Ricardian theory share the common view that international trade patterns are explained by comparative advantage, but they assume different sources of comparative advantage: factor endowments differences in the first case and differences in labor productivity in the second. The standard neoclassical model predicts that real wage rates will be equalized with international trade, whereas the standard Ricardian model predicts that they will not.

The facts on real wage rate differences shown above refute neoclassical theory, but are consistent with Ricardian theory. This conclusion is stated in most textbooks. However, it is argued there that the standard Ricardian model has limitations because it leaves unexplained the distribution of income. The objective of this paper is to close this gap by developing a generalized Ricardian model that can explain labor productivity levels, trade patterns, income distribution, and real wage rate differences across countries.

The paper is organized as follows. Sections 1 and 2 summarize the standard models of neoclassical and Ricardian trade theories. Their predictions are confronted against the basic fact of the observed real wage differences. The new Ricardian model is developed in sections 3 and 4 and its predictions are confronted against facts in section 5. Section 6 concludes.

1. NEOCLASSICAL MODELS

The neoclassical theory assumes that countries differ in their factor endowments and also that goods are produced with different factor intensities. The theory also assumes that market forces will lead to particular *pre-trade* relative prices. The relative price of labor-intensive goods (relative to the price of capital-intensive goods) in labor abundant countries will be cheaper than it is in capital abundant countries. Therefore, countries will have incentives to trade, shipping goods from cheaper sources to more expensive places. Thus, international competition will equalize relative prices, which will lie between those pre-trade relative prices.

Inter-industry trade: The Heckscher-Ohlin-Samuelson (HOS) Model

The Heckscher-Ohlin-Samuelson (HOS) model (Samuelson, 1948) is an extension of the standard neoclassical general equilibrium model to international trade of goods. The model seeks to explain inter-industry trade. The model includes the following auxiliary assumptions:

A. technology is uniform everywhere and shows constant returns to scale;
B. perfect competition reigns everywhere;
C. full employment reigns everywhere;
D. all goods are tradable.

Then the model is able to generate the following empirical predictions:

(1) relative prices of goods traded are uniform everywhere (net of transportation costs);
(2) countries export goods that use more intensively the factor with which they are relatively more endowed;
(3) relative factor prices are uniform everywhere; moreover, not only relative factor prices are equalized with trade, but also real wage rates are also

equalized across countries (which is called the “factor-price-equalization theorem” in the literature).

According to HOS model, therefore, the flow of goods between countries is a perfect substitute for the direct flow of factors between countries. This is why real wages are equalized between countries through trade: trade of goods is equivalent to migration of workers. Income distribution in each country is thus determined by the trade specialization. However, prediction (3) is refuted by facts, for real wages are not equalized across countries, as shown above, and thus the model must be abandoned.

Intra-industry Trade: Increasing Returns Model

The increasing returns model seeks to explain intra-industry trade. It assumes that the existence of technology of increasing returns or economies of scale in the production of those goods explain trade. Increasing returns refer to economies of scale that are internal or external to the firms.

The existence of economies of scale internal to the firm implies the following relationship: The higher the level of output of the firm, the higher the productivity level and the lower the average cost of producing the good. Firms in different countries that are able to produce this good would seek international markets to achieve gains in productivity. Hence, the good could be produced in any country. The usual specialization hypothesis is that large countries will naturally produce the good for domestic market and then will easily conquer the international markets. How is trade possible for the same good? There will be monopolistic competition in the international market, which includes product differentiation strategies by firms.

External economies of scale imply economies of scale external to the firm but internal to the industry, which will also generate higher productivity at firm levels when the industry size is large. The firm’s level of productivity and the average cost depends not

only on the level of output of the firm, but also upon the level of output of the industry. The concentration of production of a good in some countries will reduce the average cost and thus these countries will seek to sell it in international markets. Countries that started producing the good first—due to some accident, not to factor endowments—will tend to export the good and will tend to remain doing so. Other countries cannot replicate the production history and will tend to continue as importers. Thus, there is path dependence in international trade, that is, history matters.

The theory of increasing returns predicts that technological progress in generating economies of scale will expand intra-industry trade. However, the theory cannot explain specialization by countries. The sources of competition between countries are not identifiable (Krugman and Obstfeldt, 2009, p. 132). This model cannot be refuted with facts and thus must also be abandoned.

2. THE STANDARD RICARDIAN MODEL

Another popular model of comparative advantage comes from the Ricardian theory. According to this theory, comparative advantage among countries comes from differences in relative labor productivities.

The theory assumes that countries have labor as the sole scarce factor of production; moreover, countries differ in the relative labor productivity of producing goods. Market forces will lead to differences in *pre-trade* relative prices, which reflect differences in relative labor productivity. Countries in which the ratio of labor productivity in good B to labor productivity in good C is higher than it is in the rest of countries will show that the *pre-trade* price ratio of good B to good C is lower than it is in the other countries. Hence, the first group of countries has comparative advantage in good B; that is, its relative labor productivity in good B is higher than it is in good C. Therefore, there are incentives to trade these goods between countries and international competition will lead to relative prices equalization, which will fall between the pre-trade relative prices.

The standard Ricardian model includes the following auxiliary assumptions:

a. labor is the only production factor and average labor productivity in every industry is constant and exogenously determined;
b. full employment of labor reigns everywhere;
c. perfect competition reigns everywhere;
d. all goods are tradable.

Then the model generates the following empirical predictions:

(i) relative prices of goods traded are uniform across countries (net of transportation costs);
(ii) countries export those goods in which the relative labor productivity is higher than it is in the other countries;
(iii) real wage rates are not equalized across countries, but relative wage rates between countries will reflect differences in relative labor productivities.

To illustrate these results, consider the model presented in Krugman and Obstfeld, (2009, Chapter 3). Thus consider a world of two goods (B and C), two countries (H and F), and one type of labor. Let a_{Lj} represent the quantity of labor L that is technologically required per unit of good j in country H, whereas a^*_{Lj} (with asterisk) will refer to country F. Hence, by assumption:

$$(a_{Lc}/a_{Lb}) < (a^*_{Lc}/a^*_{Lb}) \quad \text{or} \quad (a_{Lc}/a^*_{Lc}) < (a_{Lb}/a^*_{Lb}) \qquad (1)$$

Then home country H has comparative advantage in good C and foreign country F in good B. Before trade, relative prices (P_b/P_c) in each country reflect relative labor costs. Then,

$$(P_c/P_b) = (a_{Lc}/a_{Lb}) < (a^*_{Lc}/a^*_{Lb}) = (P^*_c/P^*_b) \qquad (2)$$

Good C is thus relatively cheaper in H; hence, there are incentives to ship good C from the cheaper source H to the more expensive place, country F. Equilibrium relative price for both countries in the trade situation $(P_c/P_b)^0$ will then lie between pre-trade relative prices, as follows:

$$(P_c/P_b) < (P_c/P_b)^0 = (P^*_c/P^*_b)^0 < (P^*_c/P^*_b) \quad (3)$$

Average labor productivity or output per worker must be equal to real wage rate because labor is the only production factor. Given that good B is produced in country F and good C in country H, we have

$$w^*/w = (1/a^*_{Lb}) / (1/a_{Lc}) \quad (4)$$

Because average labor productivity is just the inverse of labor coefficients per unit of output, real wage rates (w^*/w) will be proportional to relative labor productivities in the two goods exchanged by the two countries. This is an important property of the Ricardian model.

Consider the following numbers for the labor coefficients (also taken from Krugman and Obstfeldt, 2009, Chapter 3):

$$a_{Lb}=2,\ a_{Lc}=1,\ a^*_{Lb}=3,\ a^*_{Lc}=6 \quad (5)$$

Country H uses less quantities of labor per unit of output in both industries compared to country F; therefore, country H has absolute advantage in both goods. Because the difference is greater in good C, country H has comparative advantage in good C. Using equation (2), we can see that the relative price of good C in terms of good B is ½ in country H and 2 in country F. Let the equilibrium relative price after trade—the terms of international trade—be equal to one in both countries, just by choosing the appropriate units in which goods are measured.

Now it can be shown that real wage rates are indeed proportional to average labor productivities, as shown in equation (4), which is true in units of the producing good, but also measured in any price. This can be explained as follows:

> In country H, output per worker is equal to one unit of good C, which in the market can be exchanged for one unit of good B; hence, a worker produces indirectly one unit of good B; therefore, the real wage rate (equal to output per worker) is one, measured in units of good C or B. In country F, output per worker is equal to 1/3 of unit of good B, which in the market can be exchange for 1/3 units of good C; hence, a worker produces indirectly 1/3 of good B; therefore, the real wage rate is 1/3, measured in units of good B or C.

Therefore, the real wage rate in country H is three times higher than it is in country F; and average labor productivity in country H is also three times higher than it is in country F.

According to Popperian epistemology, a good theory should survive the process of empirical refutation of its predictions. Regarding empirical refutation of the standard Ricardian model, prediction (ii) is consistent with the results of empirical studies: indeed countries export those goods that show higher relative labor productivity than their partners, as reported in two of the most popular textbooks: Krugman and Obstfeld (2009, Figure 3-6, p. 49) and in Carbaugh (2011, Figure 2-9, p. 57). Prediction (iii) is also consistent with facts, as shown in Table 1 above. According to the standard Ricardian model, differences in real wage rates reflect labor productivity differences; moreover, closer real wage rates imply closer labor productivities. The observed closer real wage rates within the First World and the larger differences between the First World and the Third World are thus consistent with the standard Ricardian model. Hence, there is no reason to reject the standard Ricardian model.

In sum, the Ricardian model tends to be consistent with facts, which is not the case with the HOS model, as pointed out in the most popular textbooks. Thus Krugman and

Obstfeld (2009) state: “Most international economists regard the Ricardian model as too limited… By contrast, the [HOS] model has long occupied a central place in trade theory. So the model that predicts trade best is too limiting for other purposes, while there is by now strong evidence against the [HOS] model” (p. 81).

When a theoretical model is refuted by facts, we are unable to identify which assumptions are responsible for the outcome. The entire set of assumptions fails jointly. In the case of HOS model, the assumptions say that countries are equal in every respect, except in the *quantities* of factor endowments; that is, partner countries are qualitatively homogenous societies. Therefore, any neoclassical model would arrive at the same results: Real wages equalization. The alternative is to develop a new Ricardian model that is not “too limiting for other purposes.” This is the option taken in this paper.

3. A GENERALIZED RICARDIAN TRADE MODEL

A new Ricardian model is now presented. The new Ricardian model intends to show that, under less restrictive assumptions, the basic predictions will remain unchanged, but the model will be able to explain additional features of international trade, such as distribution relations.

Assumptions of the new model

Eliminate the first assumption (a), shown above. Assume instead a production process in which labor productivity will reflect the effect of the interactions between labor and the other non-labor production factors. The model will assume that the relevant non-labor factors are the following:

- level of technological knowledge;
- physical capital;

- human capital;
- natural resources, including land;
- public goods: infrastructure and social order.

Technology, physical capital, and human capital are also included in the neoclassical trade models. Natural resources are sometimes included in neoclassical models, although the assumption is that there exists overall substitution between natural resources, capital, and labor (Solow 1974); in contrast, bio-economics models assume that natural resources, particularly mineral resources, are not substitutable and thus the production process cannot go on forever (Georgescu-Roegen 1971). The model will adopt this assumption.

Referring to public goods, the assumption that physical capital in the form of infrastructure plays a significant role in the production process is also standard in economics. Social order as public good and as factor of production has been assumed in some theoretical models (Figueroa, 2009).

In the short run, given those non-labor factors, there will be an effect of the number of workers employed on labor productivity, which is positive and subject to generalized diminishing returns (due to variable factor proportions and also due to differences in the quality of natural resources, which is called Ricardian diminishing returns). At the firm level, under this set of assumptions, the same individual worker will contribute to the production of output in different quantities, depending on the amount of the non-labor factors with which he or she is equipped, and also on the number of other workers with which cooperates. In the economic process, labor productivity is not worker-specific; it is an economic and social category.

For a given productive capacity of any industry, there will be a curve showing values of the average labor productivity that decline as more workers are employed. This declining curve can be defined as the *level* of average labor productivity in the industry. In the short run, changes in market prices and wage rates will lead the industry to

change the number of workers employed, which implies changes in the average labor productivity around the given level.

The standard assumption of profit maximization behavior of firms implies, in the short run, that firms will employ workers up to the number in which the real wage rate is equal to the *marginal* productivity of labor. In order to satisfy the second order conditions of this maximization problem, this model assumes diminishing returns, which implies that in equilibrium marginal productivity of labor is smaller than the average productivity. In a competitive labor market, the demand for labor will be equal to the aggregate marginal productivity of labor, which together with the given quantity of labor supplied will determine the real wage rate, assuming (just for the sake of simplicity) that the labor market is Walrasian. The market real wage rate implies that the real wage rate is smaller than the aggregate *average* productivity of labor; that is, this gap is the origin of profits and rents.

Figure 1 illustrates both the standard Ricardian model and the new one. Consider first the standard Ricardian model. Panel (a) shows the differences in the average labor productivity in good B between the two countries. Panel (b) does the same thing for good C. Labor productivity values represented in Figure 1 are those derived from the technological labor coefficients shown in equation (5) above. Thus, by assumption, the differences are such that country H is more productive in both goods; but the difference is higher in good C. Then country H has absolute advantage in both goods and relative advantage in good C; thus, country H will specialize in good C and country F in good B. Just for the sake of simplicity, let both countries be endowed with the same quantities of labor, equal to L'. Then points F and H indicate the production equilibrium situations under international trade.

In order to represent the new Ricardian model in Figure 1, substitute the assumption of fixed average labor productivity for variable values, and let the average labor productivity curves go through points F and H. Thus, curve B^* represent the *level* of average labor productivity of good B in country F, and curve C that corresponding to

good C in country H. The equilibrium situations are also at points F and H, which can be repeated period after period, as long as the exogenous variables remain unchanged. The exogenous variables include technology, physical and human capital, land, infrastructure and social order. Natural resources other than land will be ignored; the assumption is that they are redundant factors for the time being. The size of the labor force is another exogenous variable.

The effects of changes in the exogenous variables upon the level of average labor productivity are similar in both countries and are as follows. The same quantity of workers equipped with more physical capital, human capital, land, infrastructure, or better technology, will produce higher output, and thus the labor productivity curve will be shifted upward. A lower degree of social order will imply a production process that will be repeated period after period but with firms facing more interruptions and using more labor inputs (as guards and fences for property protection) than what is technologically needed, compared to a social environment of higher social order. Therefore, the effect of a higher degree of social order is also to shift the labor productivity curve upwards.

Assume that the degree of social disorder in society depends upon the outcome of the social conflict about distribution, the degree of income inequality, as proposed by Figueroa (2009). Also, assume that the *level* of income inequality degree depends upon the degree of inequality in the distribution of economic and political assets among individuals, which will be called the *initial inequality*, and to be represented by δ. (Note that income inequality is endogenous in the economic process, but the initial inequality in assets distribution among individuals is exogenous.) Therefore, an increase in the initial inequality will raise the level of the income inequality degree and thus the level of social disorder. The effect of an increase in the initial inequality (δ) is to shift the labor productivity curve downward.

Figure 1 shows that country H has higher levels of average labor productivity in both goods compared to country F. These differences in labor productivity assume that

country H is more endowed with physical capital, human capital, land, infrastructure, and social order than country F. (Technology is still assumed to be homogenous in both countries.) These country endowments constitute a vector and will be called E for home country H and E^* for foreign country F, such that $E>E^*$. The labor productivity curves shown in Figure 1 have these endowments as the parameters that fix the level of each curve. The country endowments include not only quantitative factors, but also qualitative factors (degree of social order).

Equilibrium conditions

Figure 1 depicts the equilibrium conditions. Demand for labor in country F is given by curve b^* (equal to marginal productivity curve), which determines real wage rate w^*. Similarly, in country H, demand for labor is given by curve c, which determines real wage rate w. Introducing the assumption that equilibrium relative prices are equal to one in both countries, as shown above, the real wage rates in both countries are comparable; thus, the real wage rate in country H is higher than in country F (that is, $w>w^*$).

Figure 1 also shows profits (including Ricardian rents) per unit of worker, which are measured by the vertical segment Ff in country F and by Hh in country H. Total profits in country F will therefore be equal to the area that results from multiplying the vertical segment Ff by the horizontal segment OL', which is the shaded area located above the area representing the total wage bill (w x OL'). In the case of country H, total profits and Ricardian rents will be equal to the shaded area that results from multiplying the vertical segment Hh by the horizontal segment O'L, which lies on top of the area that represents the total wage bill. Income distribution is thus determined in each country. Given δ, income distribution therefore depends upon the pattern of trade; if the specialization were in the opposite direction, income distribution would be different in both countries.

Trade patterns are thus determined by comparative advantage, which comes from differences in relative labor productivities of countries. International trade leads to price equalization of goods but not to real wage rates equalization. Real wage rates are not equal to the corresponding average productivity, but to a fraction of it, the marginal labor productivity; therefore, relative real wage rates (w^*/w) are not strictly proportional to relative labor productivities (as in the standard Ricardian model), but are related to them. Higher average labor productivity still implies higher real wage rate. This result can be shown as follows. From equation (4), relative real wages can now be written as:

$$w^*/w = (1/a^*_{Lb}\,[1 + \beta]) / (1/a_{Lc}\,[1 + \gamma]) \qquad (6)$$

Coefficients β and γ indicate the share of profits in the average productivity (the Ff and Hh segments in Figure 1), which firms could obtain through the mechanism of setting a mark-up upon the wage cost to determine the market price of the good. The mark-up is endogenous.

In the generalized Ricardian model, the level of the average labor productivity depends upon production factors that are quantitative and qualitative, which are homogeneous and heterogeneous across countries. In addition to the standard "factor endowments" of neoclassical models (physical capital, human capital, labor, and technology), the endowments include dowry (natural resources) and quality of society (degree of social order or degree of inequality). These production factors may be called the *composite factor endowments* of every country to distinguish it from the neoclassical term "factor endowments."

The generalized Ricardian model thus assumes quantitative and qualitative differences in factor endowments. Therefore, there are site-specific factors, which refer to differences in biophysical environments (particular natural resources endowments) and social environments (particular degree of social order and degree of inequality). The levels of labor productivity by countries depend upon the qualitative and quantitative

differences in factor endowments. Hence, the new Ricardian model can explain international trade among heterogeneous countries.

The generalized Ricardian model also predicts that some goods cannot be produced everywhere because natural resources are needed, which are available in some countries only. Thus, tropical goods can only be produced in the tropical climates; so tropical countries will export tropical goods. Similarly, countries endowed with mineral resources will export minerals, and countries endowed with petroleum resources will export oil. Certainly, this is not to descend to "such fatuities as: the tropics produce tropical fruits…," as Samuelson called these propositions in his classical paper (Samuelson, 1948, p. 182). We do not need to invoke the Ricardian-Viner model either. These facts are consistent with the predictions of the generalized Ricardian model.

As observable equilibrium conditions, the new Ricardian model predicts that countries will specialize in those goods in which they have comparative advantage, which comes from differences in labor productivity levels and real wage rates. However, because real wage rates cannot be independent of the labor productivity level, comparative advantage depends upon differences in labor productivity levels alone. Labor productivity levels in a country may be higher in both industries, but then the country will specialize in the industry in which the difference is larger; that is, what is relevant to explain international trade is the relative differences in the levels of the average labor productivities. *Comparative advantage now refers to differences in the productivity curve levels rather than on the given coefficients of labor productivity*. Another prediction as observable equilibrium condition is that trade cannot equalize real wage rates across countries.

As we know, classical economics assumes that labor is the essential factor of production; in the production process, all inputs are reducible to human labor. Therefore, country differences in composite factor endowments are reducible to labor and thus to differences in the levels of the average labor productivity. Therefore, the labor coefficients mentioned above—equation (5)—should be read as the total quantity

of labor (direct and indirect), that is incorporated in one unit of good B and one unit of good C; that is, those coefficients are derived from the economic process that is represented by the Leontief system. In the language of the Leontief system, labor is a primary factor of production of goods. The only difference with the Leontief system is that labor coefficients are endogenously determined. Therefore, labor productivity levels are the essential factors that determine comparative advantage and thus explain the international trade patterns. We may then call this model the *generalized Ricardian trade model*.

Can low-productivity countries compete in international markets? The generalized Ricardian model says yes, provided that their real wages are low. As shown in Figure 1, country H has comparative advantage in good C; that is, country H's relative productivity in good C is higher than it is in good B. Country H has a cost advantage in good C, despite its higher wage rate, because the higher wage rate is more than offset by its higher labor productivity. Similarly, because of its lower wage rate, country F has a cost advantage in good B, even though it has lower labor productivity.

4. A DYNAMIC MODEL

How could we explain the persistence of real wage rate differences between the First World and the Third World in spite of their significant trading? In order to answer this question, a dynamic model is needed. Given the trade and distribution relations seen above, it would be sufficient to explain the changes in output per worker over time.

Explaining changes in output per worker over time is the question addressed in growth theory. If we had a *valid* growth theory in open economies, we could just invoke it and explain real wage rate differences. However, such valid theory is not available. For one, the standard neoclassical growth model ignores international trade. The most common empirical evidence says that output per worker gap between the First World and the

Third World tends to remain over time (v.g., Barro and Sala-i-Martin, 2004). This fact suggests that real wage rates gaps also tend to persist over time.

A very simple dynamic model is proposed here. It is so simple that there is no need for presenting it as a formal model. The model will assume that physical and human capital endowments will change endogenously through investment (private and public), whereas the initial inequality will be the only factor that remains exogenous. Technological progress is common to all countries, so technological differences are the result of differences in investment as well. Even natural resources can change endogenously with investments that tap new supplies. Investment is the critical variable.

In the long run, therefore, the level of labor productivity (output per worker) by countries is endogenous and depends upon investment. In the case of private investment, in an open economy, firms decide in which country and industry to invest. They may want to exploit the natural resource endowment, human capital endowment, infrastructure capital, or the external economies of a country, or its social order. Assume that First World countries are more endowed with physical and human capital than Third World countries; also assume that natural resources are randomly distributed across countries; finally, assume that the degree of initial inequality is higher in the Third World.

In a two-by-two model (two countries and two goods), the solution involves one country producing one good. In a world of several countries and several goods, countries will compete on what goods to produce. Investment in one particular industry will increase labor productivity in that industry, as workers will become equipped with more capital and higher technology. Comparative advantage will then be created or reinforced in that industry. Hence, the labor productivity levels and the comparative advantage of countries are endogenous in the long run, as it depends upon private investment.

What are the determinants of the allocation of private investment across countries? The standard theory of investment portfolio (mean-variance theory) assumes free capital movement across countries; it also assumes that investors seek the highest expected rate of return with the lowest risk. The rate of return depends negatively upon the country's physical capital stock (due to diminishing returns). The assumption that the First World is more endowed with physical capital than the Third World would imply a higher rate of return in the Third World and more incentives to invest there. So capital should be flowing to the Third World, but it does not. Professor Robert Lucas (1990) solved this paradox: The First World is also more endowed with human capital, which increases the rate of return of physical capital and offsets the diminishing returns effect. Therefore, we may conclude that the rate of return between these two groups of countries may not be too different. The investment allocation would thus depend basically upon where the risk is lower.

Up to now, average labor productivity has not been subject to risk. If we assume the existence of risk, then the normal labor productivity level in an industry will fall due to random shocks from the physical environment and from the social environment. In Figure 1, these shocks will imply downward shifts in the curves B^* and C; thus, these curves will show the mean values in the now stochastic model.

Assume that social disorder is the essential risk factor across countries. Then the essential factor that determines the allocation of private investment across countries is the degree of income inequality of countries, which underlies social disorder, as assumed above. Given that income inequality is endogenous in the economic process, the exogenous variable is the initial inequality: The degree of inequality in the distribution of economic and political assets among individuals (δ).

The dynamic model therefore implies the following international trade mechanism. Firstly, countries compete in the international arena for private investment, and here they compete with their degree of social order, and the underlying degree of equality; then countries compete in the international markets of goods with their differences in

labor productivity, the result of differences in private and public investments. In the long run, the international trade pattern is endogenous: It is the degree of initial inequality of countries the essential factor that determines private investment and labor productivity levels, which in turn determine their international competitiveness, and the trade pattern. *International competition between countries in the long run depends upon their degrees of inequality; societies that are more equal will tend to increase labor productivity more rapidly.*

The dynamic model predicts that the initial real wage rate differences between the First World and the Third World will persist over time, together with the differences in the levels of labor productivities, and the patterns of trade. The private and public investment behavior shapes this result. The initial inequality is the essential factor that explains investment behavior: It is higher in the Third World compared to the First World and thus investment tends to be higher in the latter. Domestic savings play a secondary role because the model assumes free capital movements across countries. In this model, there is *inequality trap* between the First World and the Third World, rather than "poverty trap," as suggested in the growth theory literature.

5. EMPIRICAL REFUTATION OF THE GENERALIZED RICARDIAN MODEL

The generalized Ricardian model includes the following auxiliary assumptions:

(a') the *level* of labor productivity in every industry across countries is exogenous in the short run but endogenous in the long run;
(b) full employment of labor reigns everywhere;
(c) perfect competition reigns everywhere;
(d) all goods are tradable.

On the observable equilibrium conditions, the model generates the following empirical predictions:

(i) relative prices of goods traded are uniform everywhere (net of transportation costs);

(ii) countries export those goods in which the level of labor productivity are relatively higher than what they are in the other countries;

(iii) relative wage rates between countries will reflect differences in relative labor productivities, which implies that real wage rates are not equalized across countries, neither in the short run nor in the long run; however, closer differences in labor productivity imply closer differences in real wage rates;

(iv) the degree of the initial inequality in the distribution of economic and political assets (δ) determines the static and dynamic comparative advantages of countries.

By comparison to the standard Ricardian model, the generalized model maintains the assumptions, except that assumption (a) is substitute for (a'). The short run and long run assumptions are comprise in one single set of assumptions, as dynamic equilibrium is just the sequence of static equilibrium situations.

Regarding prediction (iii), and as illustrated in Figure 1, the generalized model explains the gap in real wage rates between the First World and the Third World by the difference in the average labor productivity curve C, which refers to the First World, and the curve B^*, which refers to the Third World. Facts are consistent with these predictions, as shown in Table 1 above. Data over time are unavailable, but it is more likely that the gaps in real wage rates have persisted over time.

As to physical capital per worker differences, the available data indicate significant differences. Using the Penn World Table database, the calculations of the value of capital stock per worker for a sample of First World (8 countries) and Third World (7 countries) for 1997 found that the ratio was 6:1; but with South Korea the ratio was 2:1 (Carbaugh, 2011, Table 3.2: 71). Another study, using different sources, and similar sample size for 1994, found similar ratio, 8:1 (Hofman 2000, Table 2, p.51). On the other

hand, workers in the First World are also endowed with higher levels of human capital, measured by years of schooling, than those in the Third World. The adult illiteracy rate was around 40% in the Third World compared to almost zero in the First World by 1998 (World Bank, 2001: 277). Thus, workers in the First World are more equipped with physical and human capital than those in the Third World are; this difference leads to higher average labor productivity and to higher real wage differences, as predicted by the model.

Real wage rates within the First World are relatively homogeneous because the labor productivity levels (output per worker) are also similar. First World countries are relatively more homogenous than the entire capitalist system. Intra-industry trade should be dominant in this case; indeed, this is what data show: "About one-fourth of world trade consists of intra-industry trade, [which takes place mostly] among advanced industrial countries" (Krugman and Obstfeldt, 2009: 132).

Regarding prediction (iv), the concentration of economic and political assets, the available information is scarce, but the available information points in the direction that the inequality is indeed higher in the Third World than in the First World. Regarding the inequality in the distribution of economic assets, empirical studies are even scarcer. A study on household *wealth inequality* presents estimates of Gini coefficients for a sample of 19 capitalist countries (16 from the First World and only 3 for the Third World) for the year 2000, in which the average Gini coefficient for each group of countries is very similar, around 0.67 (Davies et al., 2010, Table 7: 246).

On agricultural land concentration, one of the few studies about international comparisons, based on a sample of 103 countries of the world from the FAO database, for the period 1950-1990, showed estimates of Gini coefficients by regions. Considering only capitalist countries, the average Gini coefficients for the First World and the Third World were not much different, around 0.60 (Deininger and Squire 1998, Table 2, p. 266).

The concentration of human capital was estimated by this author from the international data of adult schooling years, for the year 1995, based on the UNESCO dataset, which is presented in a study by Barro and Lee (2000, Table 3, p. 12). The resulting average Gini coefficient from distributing the years of education between the adult population in the Third World countries is 0.60, whereas for the First World is only 0.28.

These estimates on inequality in the distribution of land, physical capital, and human capital indeed suggest that the overall inequality in economic assets is higher in the Third World compared to the First World. The major source of the inequality lies in the high concentration of human capital in the Third World. Differences in the concentration in the other economic assets do not seem to be significant. Human capital concentration is the key asset in the inequality of economic assets between the First World and the Third World.

Inequality in political entitlements, or classes of citizenship, is a qualitative variable, which makes much harder to measure its degree of concentration. Formal rules (constitutions) establish equality of citizenship everywhere. The real question is the enforcement of those rules. Second class citizenship may in fact exist in the First Word, but available studies indicate that it applies mostly to Third World countries, most of which have strong colonial legacy. Empirically the concept of second class citizenship in the Third World applies to individuals whose ability to exercise rights is limited by informal norms. This is a colonial legacy because second class citizens are the descendants of the subordinated populations of the colonial history. The international literature supplies some qualitative studies describing the different forms that second class citizenship take in the Third World and pointing out their importance for the entire economic and political processes (cf. Stewart, 2001, 2008).

The degree of inequality in the distribution of income is higher in the Third World compared to the First World, as predicted by the model: Higher inequality of assets leads to higher inequality in the flow of incomes. The estimates of the World Bank for the period 1950-1995 showed that the average Gini coefficient was around 0.30 for the

First World countries, 0.50 for Latin American countries, 0.45 for African countries and 0.35 for Asian countries (Deininger and Squire, 1996). Similar figures are shown for the period 1980-2010 by UNCTAD (2012, Chart 3.4: 56).

Given that the degree of income inequality—the underlying factor of the degree of social disorder—is higher in the Third World than in the First World, this theory predicts that foreign direct investment will flow mostly to the First World. This prediction is consistent with the available facts. Empirical studies show that the bulk of foreign direct investment (75%) flew to the First World countries in the decade of the 1990s (Markusen, 2002, Table 1.2, p. 9). The UNCTAD study also shows that of the foreign direct investment stock in 2004, the share of the Third World was only 22% (UNCTAD, 2006, Table 3.9: 108). From the figures presented in the annual World Bank Development Report, the following proportions can be derived: 75% was allocated to the First World and 25% to the Third World in 2009, whereas these proportions were 80% and 20% in 1990 (World Bank, 2001, 2010, Table 21).

Although some shift may be taking place over time, as the World Bank data suggest, the level of the proportions is clear in showing that most of direct foreign investment originates in the First World and also goes to the First World. Markusen study indeed concludes by saying, “Not surprisingly, the developed countries are the major source of outward investment, but perhaps less well known, they are the major recipients as well” (Markusen, 2002: 8).

The accumulation of human capital is also endogenous in the dynamic model. It will depend upon the degree of inequality in society. Societies in which inequality in political entitlements is more pronounced will tend to under-invest in public education and health; that is, second rate citizens will get second class education and health services from public investment, as is the case in the Third World (Figueroa, 2010). Hence, the differences in human capital endowments between the First World and the Third World will remain in the long run. Migration from the Third World to the First World, which constitutes a brain drain mechanism, reinforces those differences.

6. CONCLUSIONS

The Ricardian theory assumes that international trade is governed by comparative advantage, which originates in labor productivity differences. This paper has developed a generalized Ricardian model in which labor productivity is endogenously determined in the economic process of production, distribution, and trade. In the short run, labor productivity differences are determined by differences in the endowments of labor and non-labor factors of countries. These endowments include quantitative factors (physical and human capital together with labor force size) and also qualitative factor endowments, such as social order, which depends upon the degree of inequality. In the long run, changes in labor productivity are endogenous and depend upon the behavior of private and public investments, which in turn depend upon the degree of initial inequality of countries.

This model predicts that, in the short run, real wage rates are not equalized with trade, but differences in real wage rates reflect differences in labor productivities. Thus, the model is able to explain the observed patterns of trade, relative labor productivities, and relative real wage rate differences between the First World and the Third World countries. In the long run, the model predicts that these results will persist over time because the exogenous variable that explains the investment behavior—the initial inequality—tends to remain unchanged over time.

It is a paradox that differences in real wage rates persist between the First World and the Third World after many years of increasing globalization. The answer to the paradox given by the generalized Ricardian model is that the difference in the degree of the initial inequality between the First World and the First World has not changed much in the process of globalization. As long as this difference in the initial inequality remains unchanged, labor productivity levels will not be equalized with international trade and real wage rates will not be either.

Thus in the generalized Ricardian model presented in this paper, inequality plays a significant role in the economic process. Inequality affects labor productivity in the short run and in the long run; hence, the degree of inequality of countries plays a significant role in international competition.

In sum, available facts do not refute the predictions of the generalized Ricadian model. Therefore, there is no reason to reject the model and we may accept the Ricardian theory at this stage of our research as a good approximation of the real world. The acceptance is of course provisional, until new empirical evidence or superior theory becomes available. According to Popperian epistemology, scientific knowledge is an evolutionary process.

The role of the initial inequality (or power structure) in the process of production, trade, and distribution has been neglected in neoclassical economics. Nevertheless, it is an essential factor in classical economics and structural economics. However, this literature has not paid attention to the analytical possibility of a generalized Ricardian trade model, as can be verified in the survey article on structural economics or North-South models (Darity and Davis, 2005). The main arguments of classical economics and structural economics as presented by Darity and Davis include: history matters, not only in fixing so-called initial conditions but also in producing asymmetries between the North (First World) and the South (Third World), which are shaped by the history of colonialism (p. 165). The conclusions of the generalized Ricardian trade model are in accord with these arguments.

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Table 1 Minimum Real Wage Rates in the Capitalist System, 2009

Regions	Number of countries	Minimum real wage rate (US dollars/month, PPP)		
		Mean	SD	SD/mean
First World	**15**	**1,284**	**304**	**0.24**
Third World	**75**	**229**	**171**	**0.75**
Africa	35	139	96	0.69
Asia	16	198	129	0.65
Latin America	24	377	186	0.48

Note: The source included 17 countries in the First World, but Israel and South Korea (middle-income countries according to the World Bank) have been excluded here; it also included 18 countries in Asia, but China and Vietnam (non-capitalist countries) have been excluded here.

Source: ILO, 2010, Table SA2, pp. 116-119.

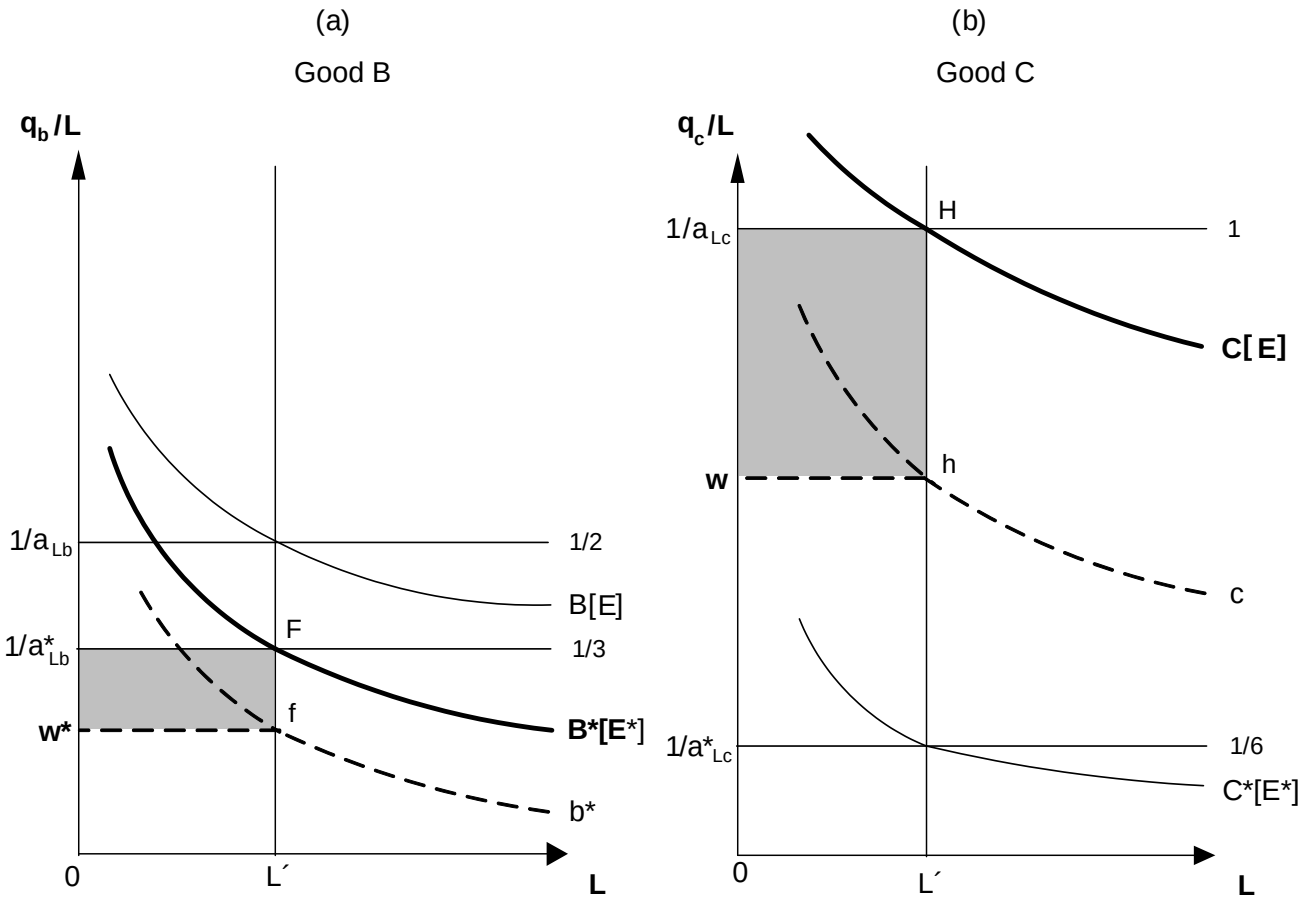

Figure 1
Differences in levels of labor productivity between Countries H (no asterisk) and F (with asterisk) for goods B and C.

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