Is Ricardo’s Essay on Profits a Precursor of the New Trade Theory?

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December 2002
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Abstract

This paper carefully analyzes a passage of Ricardo’s *Essay on Profits* ([1815] 1923), which suggests that he clearly understood the effects of both interindustry as well as intraindustry trade. In the context of the Essay model, Ricardo argues that free interindustry trade involving an exchange of manufactures for agricultural good (from England’s point of view) raises the rate of profit through lowering the relative price of the agricultural good. On the other hand, where trade involves simply an exchange of manufactures for manufactures, these being produced under conditions of economies of scale (“division of labour in manufactures” (pg. 25 of Essay)), the rate of profit is unaffected although that exchange of goods does raise welfare by augmenting the variety of commodities made available through intraindustry trade. His Essay, therefore, is a precursor of the new trade theory.

JEL classification: B12, B31

Keywords: *Essay on Profits*, intraindustry trade, interindustry trade

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1. Introduction

The Ricardian trade model that is a staple of the pure theory of international trade is based upon the England-Portugal, wine-cloth analysis developed in Chapter 7 of Ricardo’s *Principles* ([1817] 1911). That model explains only interindustry trade. The objective of this paper is to analyze a passage of Ricardo’s *Essay on Profits* ([1815] 1923), which suggests that he clearly understood the effects of both interindustry as well as intraindustry trade. Specifically, this paper argues that Ricardo had in mind, from the point of view of England, two different welfare effects from international trade: (i) Free trade increases the amount and variety of goods; and (ii) Free trade raises the general rate of profit (and hence the rate of growth). In Ricardo’s *Essay* model, there is a manufacturing sector alongside an agricultural sector. In the latter, labor is applied to a fixed supply of land so that diminishing returns to labor operate. In the context of this model, Ricardo argues that free interindustry trade involving an exchange of manufactures for agricultural good (from England’s point of view) raises the rate of profit through lowering the relative price of the agricultural good. On the other hand, where trade involves simply an exchange of manufactures for manufactures, these being produced under conditions of economies of scale (“division of labour in manufactures” (pg. 25 of *Essay*)), the rate of profit is unaffected although that exchange of goods does raise welfare by augmenting the variety of commodities made available through intraindustry trade. The relevant passage in the *Essay* is the following:

There are two ways in which a country may be benefited by trade—one by the increase of the general rate of profits, which, according to my opinion, can never take place but in consequence of cheap food, which is beneficial only to those who derive a revenue from the employment of their capital, either as farmers,
manufacturers, merchants, or capitalists, lending their money at interest—the other by the abundance of commodities, and by a fall in their exchangeable value, in which the whole community participate. In the first case, the revenue of the country is augmented—in the second the same revenue becomes efficient in procuring a greater amount of the necessaries and luxuries of life.

It is in this latter mode only* that nations are benefited by the extension of commerce, by the division of labour in manufactures (emphasis mine), and by the discovery of machinery,—they all augment the amount of commodities, and contribute very much to the ease and happiness of mankind; but, they have no effect on the rate of profits, because they do not augment the produce compared with the cost of production on the land, and it is impossible that all other profits should rise whilst the profits on land are either stationary, or retrograde.

*Excepting when the extension of commerce enables us to obtain food at really cheaper prices. (See pp. 25-6 of Essay.)

The fact that trade involving an exchange of manufactures for manufactures has no effect on the rate of profit except for a caveat on wages is repeated in the Principles:

Foreign trade, then, though highly beneficial to a country, as it increases the amount and variety (emphasis mine) of the objects on which revenue may be expended, and affords, by the abundance and cheapness of commodities, incentives to saving, and to the accumulation of capital, has no tendency to raise the profits of stock unless the commodities imported be of that description on which the wages of labour are expended. (See pg. 80, Chapter 7 of Principles.)
Notice that in speaking about trade in manufactures, Ricardo, writing after Adam Smith, had in mind the “division of labour in manufactures.” “(Nations) are benefited by the extension of commerce, by the division of labour in manufactures...—they all augment the amount of commodities, and contribute very much to the ease and happiness of mankind...” With scale economies in manufacturing, foreign trade “increases the amount and variety of the objects on which revenue may be expended.” This form of trade leads to welfare gains in the form of a wider variety of manufactures but has no effect on the general rate of profit. On the other hand, interindustry trade which involves an exchange of manufactures for food—“... where the extension of commerce enables us to obtain food at really cheaper prices”—increases the profit rate and hence the economy growth rate.

In this paper, I am not simply arguing that Ricardo was aware that economies of scale could be a cause of trade. As Krugman ([1987] 1990, pg. 63) puts it: “As Ricardo doubtless knew, and as modern theorists from Ohlin on have reemphasized, countries may also trade because there are inherent advantages in specialization, arising from the existence of economies of scale.” What seems clear from a careful reading of Essay is that Ricardo actually had in mind a model, if not mathematically written out, nevertheless one that made logical predictions about the effects of two types of trade flows—interindustry and intraindustry trade. As Maclachlan (1999, pg. 563) notes in a fascinating contrast between the writing styles of Malthus and Ricardo, “Ricardo is a model builder: beginning with just a few simple axioms, he develops an ingenious system through which definite conclusions can be deduced logically.” He continues, “Although Ricardo does not use mathematics in the expression of his theory, he presents a model that is susceptible to mathematical treatment, as later authors have demonstrated (e.g., Pasinetti 1959).”

More to the point of this paper, authors such as Findlay (1974), Burgstaller
(1986) and Maneschi (1983) have been inspired to write out formal mathematical models describing Ricardo’s analytical structure as laid out in Essay. They all fail, however, to incorporate the “division of labour in manufactures” noted in the passage in Essay in their formalizations and so, with only interindustry trade taking place, are not able to generate foreign trade within their models that leaves the rate of profit unchanged. Apart from Ricardo’s reference in the text to the division of labor in manufactures, further support for making the assumption of increasing rather than constant returns in the manufacturing sector in describing the Essay model comes from Stigler (1951, pg. 185): “Ricardo, Senior, and J.S. Mill—and their less famous confreres—announced the principle of increasing returns in manufacturing—for Senior it was even an axiom. The exclusion of agriculture was based on the empirical judgement, not that further division of labor was impossible, but that it was a weaker tendency than that of diminishing returns from more intensive cultivation of a relatively fixed supply of land.”

If I am correct in suggesting that the manufacturing sector Ricardo had in mind in Essay exhibits scale economies, one wants to know whether it is possible to generate pure intraindustry trade which leaves the rate of profit unchanged, and hence has no income distributional effects. As Stigler (1965, pg. 448) has argued, “We increase our confidence in the interpretation of an author by increasing the number of his main theoretical conclusion which we can deduce from (our interpretation of) his analytical system.” He refers to this rule of consistency with the main conclusions as the principle of scientific exegesis. The aim of our paper is to show that Ricardo’s theoretical prediction can, indeed, be established in a formal mathematical model. Hence, his Essay model is a precursor of New Trade Theory.

The New Trade Theory refers to the body of work in pure trade that incorporates the role of scale economies and product varieties in formal general-equilibrium settings. Some of the key papers include Krugman (1979), Dixit
and Norman (1980), Lancaster (1980) and Helpman (1981).\footnote{The new trade theory also includes work that introduced a strategic element in modeling trade policy but that is not my focus here.} In Krugman’s view (see Krugman [1987] 1990), the development of the new trade theory can be traced back to the development of two approaches in the rigorous treatment of the process of product development in the 1970s. The first approach is identified with the work of Dixit and Stiglitz (1977) and Spence (1976), which imposed the assumption that each consumer has a taste for many different varieties of a product. The second approach was developed by Lancaster (1979), which posited a primary demand not for varieties per se but for characteristics of different varieties and consumers differing in their preferred mix of characteristics. These alternative modeling approaches to specifying consumer preferences were put together with a production side that exhibited internal economies of scale. Because new firms are able to differentiate their products from existing firms, they retain some degree of monopoly power. However, because of free entry and exit, economic profits are driven to zero.

Two empirical facts of the postwar period seem to have helped in the general acceptance of the new trade theory as essential to understanding developments in the real world. The first is the dominance of intraindustry trade flows as opposed to interindustry trade flows that the application of the industrial organization tools highlighted in the previous paragraph helped to elucidate and provide a rigorous foundation for. The second is that the dominance of intraindustry trade in intra-Europe trade flows seemed to explain the absence of income distribution problems resulting from economic integration in the formation of the EEC.

It is remarkable that Ricardo, writing in the early 19th century, already had an implicit analytical model which made clear predictions about income-distributional effects depending on the nature of trade flows. In the next
section, we seek to lay out the mathematical formalization of Ricardo’s *Essay* model which can explain the “two ways in which a country may be benefited by trade.” This is followed by a discussion of the caveat on wages noted earlier, namely, how intraindustry trade can affect the rate of profit if wages fall as a result of trade.

2. Mathematical formulation of Ricardo’s argument

We introduce Ricardo’s “division of labour in manufacturing” by assuming that scale economies are internal to firms. The market structure that emerges is one of Chamberlinian monopolistic competition. By introducing a monopolistically competitive manufacturing sector, we add a channel through which trade raises the welfare of the consumers of manufacturing goods via a wider variety of goods being made available to them for consumption even when such trade leaves the profit rate invariant.

The manufacturing sector is able to produce any of a large number of goods that enter symmetrically into the utility functions of the landlords, who are assumed to be the sole demanders of the differentiated manufacturing good, which we will call the luxury good.\(^2\) The total number of differentiated goods actually produced, \(n\) (which is to be determined endogenously), is assumed to be a large number, although small relative to the number of potential products. All goods are presumed to be produced with the same production function, exhibiting rising average products, and constant marginal products. With symmetry built into the problem, we are assured that all manufacturing goods actually produced will be produced in the same quantity, and sold at the same price.

There is a natural wage rate, \(w\), fixed in terms of corn, the agricultural

\(^2\)When we deal later with Ricardo’s caveat on wages, we show how intraindustry trade can, indeed, affect the profit rate if workers also consume the differentiated manufacturing good.
good. The time elapsing between input of labor and the availability of final
output is fixed, and assumed equal in both the manufacturing and agricul-
tural sectors. In the production of corn, there are diminishing returns to
labor because of the fixed supply of land. The corn output is given by

\[ C_t = F(T, L_{c,t-1}), \]  

where \( C_t = L_{c,t-1} f(T/L_{c,t-1}), \) \( f'(\cdot) > 0 \) and \( f''(\cdot) < 0. \) Here \( T \) is the fixed
supply of land, while \( L_{c,t-1} \) is the labor allocated to the agricultural sector.
Profit maximization requires that the wage rate be set equal to the present
discounted value of the marginal product of agricultural labor. Thus

\[ w = \frac{f(T/L_{c,t-1}) - (T/L_{c,t-1}) f'(T/L_{c,t-1})}{1 + r_t}, \]

where \( r_t \) is the rate of profit.

Let us next consider the profit-maximizing pricing behavior of the indi-
vidual manufacturing firm. By the symmetry imposed on the problem, we
can simplify our study of the behavior of the typical manufacturing firm.
Thus, the typical manufacturing firm solves the following problem:

\[ \text{Maximize } p_t M_t \frac{1}{1 + r_t} - (\bar{l}_M + a_M^{-1} M_t)w \]

by choosing \( M_t \), the output of the differentiated good firm. For the individual
firm, the rate of profit is treated as a parameter; it is, however, determined
endogenously for the whole economy. Here, \( p_t \) is the relative price of manu-
factures in terms of corn; and \( \bar{l}_M + a_M^{-1} M_t \) gives us the labor used in producing
each good at the beginning of the period, where \( \bar{l}_M \) is the fixed cost (in la-
bor units) while \( a_M \) gives the constant marginal physical product of labor.
Solving the problem yields

\[ w = \frac{p_t[1 - (1/\epsilon)] a_M}{1 + r_t}, \]

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where $\epsilon > 1$ is the elasticity of demand for the differentiated good. For simplicity, we assume that the landlord consumes only the luxury good and has a CES utility function of the form $[\int_0^n c^\alpha_i di]^{1/\alpha}$, where $0 < \alpha < 1$. In that case, the elasticity of demand for the differentiated good, $\epsilon$, is given by $(1 - \alpha)^{-1}$, a constant. Equating (2) and (3), we have

$$w = \frac{f(T/L_{c,t-1}) - (T/L_{c,t-1})f'(T/L_{c,t-1})}{1 + r_t} = \frac{p_t \alpha a_M}{1 + r_t}. \tag{4}$$

Rearranging (4), we obtain after simplifying, an expression for the rate of profit:

$$r_t = \frac{p_t \alpha a_M - w}{w} = \frac{f(T/L_{c,t-1}) - (T/L_{c,t-1})f'(T/L_{c,t-1}) - w}{w}. \tag{5}$$

We now work toward obtaining solutions for $M_t$, $p_t$ and $n_t$, the number of differentiated product firms in the manufacturing sector. With the monopolistically competitive structure in the manufacturing sector, expected profits will be driven down to zero by the free entry and exit of firms. This condition, together with the first-order condition from solving the manufacturing firm’s problem, will allow us to determine the output of the typical differentiated product firm. With zero expected profits in equilibrium, we have

$$\frac{p_t M_t}{1 + r_t} = w(\tilde{l}_M + a^{-1}_M M_t). \tag{6}$$

Equations (3) and (6) together give us

$$M_t = \frac{\alpha a_M \tilde{l}_M}{1 - \alpha}. \tag{7}$$

\[3\]It is straightforward to generalize by assuming that the landlord spends a fraction of his income on the agricultural good by supposing that his utility function is given by $c_A^{1-\theta}[\int_0^n c^\alpha_i di]^{\theta/\alpha}$, $0 < \theta < 1$, where $c_A$ is consumption of the agricultural good. All wages and profits are spent on corn. In the next section, we discuss what happens when workers also spend a fraction of their income on manufactures.
We see that each firm’s output is larger the higher is the elasticity of demand, the higher is the marginal physical productivity of labor, and the larger is the fixed cost (in labor units) that has to be incurred to set up the firm.

From the second equation in (4), we obtain an inverse relationship between the labor allocation to the agricultural sector, $L_{c,t-1}$, and the relative price of the manufacturing good, $p_t$. Substituting this relationship into (1) gives us a negative relationship between the output of corn, $C_t$, and the relative price of the manufacturing good, $p_t$. Using the market-clearing condition for the corn output in period $t$, we can determine the equilibrium relative price of the manufacturing good. The desired wage fund for period $t$ is $(1 + r_t)W_{t-1}$, where $W_{t-1}$ is the wage fund in period $t - 1$. Using (3), we can write the desired wage fund in period $t$ as

$$W_t = p_t \alpha a_M L_{t-1},$$

where $L_{t-1}$ is the total number of workers employed in period $t - 1$. We require for market clearing that the desired wage fund (demand for corn) be equal to the desired supply of corn in period $t$, that is,

$$p_t \alpha a_M L_{t-1} = F(T, L_{c,t-1}),$$

where we recall that $L_{c,t-1}$ is a negative function of $p_t$. The equilibrium relative price of the agricultural good, $p_t^{-1}$, is, therefore, determined and we can easily check that it is higher the lower is the land-labor ratio, the higher the elasticity of demand for the manufacturing good, and the more productive labor is in the manufacturing sector. Thus, *ceteris paribus*, the land-scarce country would, in autarky, have relatively more expensive corn.

With the equilibrium relative price, $p_t^e$, determined, the optimal amount of labor allocated to the corn sector, $L_{c,t-1}^e$, is also determined. The residual, $L_{t-1} - L_{c,t-1}^e$, is employed in the manufacturing sector, giving us the optimal
number of differentiated good firms,

\[ n_t = \frac{L_{t-1} - L_{c,t-1}^e}{l_M + a_M^t M_t}, \]  

(10)

where \( M_t \) has already been determined in (7).

Now with a positive profit rate, the wage fund is augmented at the beginning of each new period. This implies that the size of the employed workforce rises over time with the corresponding implication that the desired wage fund increases over time. Consequently, the relative price of corn, \( p_t^{-1} \), increases over time. From the relationship, \( r_t = [p_t a a_M - w]/w \), this implies that the profit rate declines over time. Alternatively, we note that with the relative price of corn rising over time, the labor allocated to the corn sector also increases; with a fixed supply of land, the marginal productivity of labor falls, giving rise to a declining rate of profit.

We now consider how intranindustry trade “increases the amount and variety of the objects on which revenue may be expended” without affecting the rate of profit before we turn to show how the extension of commerce that “enables us to obtain food at really cheaper prices” will raise the profit rate.

Suppose that there are two economies that are completely identical, including history as given by \( L_{t-1} \). The relative price of corn, \( p_t^{-1} \), would be identical in both economies, and there would be no basis for interindustry trade. There would, however, be intranindustry trade since landlords have a love for variety built into their tastes. With intranindustry trade, both countries continue to face identical relative good prices as would prevail in autarky. This implies that intranindustry trade has no effect on the general rate of profit. There is, however, still a welfare gain as foreign trade here “increases the amount and variety of the objects on which revenue may be expended.” More precisely, noting that the indirect utility function of the landlord is given by \( n_t^{(1-\alpha)/\alpha}[T \partial F(T, L_{c,t-1})/\partial T] p_t^{-1} \), international trade in-
creases the range of varieties available to the landlords and raise their utility.\textsuperscript{4} It, however, has no effect on the rate of profit.

Turning to the possibility of interindustry trade, let us use an asterisk to represent variables of the foreign country. Let us suppose that at the point when both countries open up to trade, the foreign country is land-abundant so that $T^*/L^*_{t-1} > T/L_{t-1}$. It follows from the earlier discussion that $p_t^* > p_t$ just before both countries open up to trade, assuming identical production technologies and natural wage rates in both countries.

When free trade is introduced, the foreign country is a net-exporter of the agricultural good, giving a Heckscher-Ohlin basis for trade. However, there is also intraindustry trade in manufactures with the home country being a net-exporter of the manufacturing good. Under trade, therefore, the home country is a net-importer of corn.

To obtain the world market-clearing relative price, we use the condition that the world market for corn clears:

$$p_t \alpha a_M (L_{t-1} + L^*_{t-1}) = F(T, L_{c,t-1}^c) + F(T^*, L^*_{c,t-1}).$$

This equation can be rearranged to yield

$$p_t \alpha a_M = \left( \frac{L_{t-1}}{L_{t-1} + L^*_{t-1}} \right) (\frac{L_{c,t-1}^c}{L_{t-1}}) f(T/L_{c,t-1}) + (\frac{L^*_{t-1}}{L_{t-1} + L^*_{t-1}}) \left( \frac{L^*_{c,t-1}^c}{L^*_{t-1}} \right) f\left( T^*/L^*_{c,t-1} \right).$$

It can be readily checked that the world equilibrium relative price lies in between the two countries’ autarkic relative prices.

Upon opening up to free trade, there is a shift of labor out of agriculture into manufacturing in the home country as the price of corn falls. In the foreign country, on the other hand, there is a shift of labor into the agricultural sector. Correspondingly, foreign trade raises the general rate of profit in the

\textsuperscript{4}Since, given $T$, total rent, $T \partial F(T, L_{c,t-1}^c)/\partial T$, depends only on $p_t$, and that is unchanged, the benefit from trade comes entirely from an increase in variety, $n_t$. 

home country, which is able to “obtain food at really cheaper prices,” that being Ricardo’s main argument for why England should remove its impediments to the importation of corn even though the rate of profit declines in the foreign agricultural good exporting country.

3. A caveat on trade and wages

Ricardo has argued that intraindustry trade—an exchange of manufactures for manufactures—alone, if it does not affect the relative price of the agricultural good, will have no effect on the general rate of profit. England will see its profit rate increased if trade has an interindustry component, allowing it to “obtain food at really cheaper prices.” This analysis is made under the proviso that workers consume only corn and that the real wage is unaffected by trade. That having been said, there is an interesting footnote appended to the text which suggests one channel through which intraindustry trade does affect the rate of profit. The relevant text is:

> Profits then depend on the price, or rather on the value of food. Every thing which gives facility to the production of food, however scarce, or however abundant commodities may become, will raise the rate of profits, whilst on the contrary, every thing which shall augment the cost of production without augmenting the quantity of food,* will, under every circumstance, lower the general rate of profits. The facility of obtaining food is beneficial in two ways to the owners of capital, it at the same time raises profits and increases the amount of consumable commodities. The facility in obtaining all other things, only increases the amount of commodities.

*If by foreign commerce, or the discovery of machinery, the commodities consumed by the labourer should become much cheaper,
wages would fall; and this, as we have before observed, would raise the profits of the farmer, and therefore, all other profits. (See pg. 26 of Essay.)

If the worker does not consume only food, as assumed in the analysis above, but also spends a fraction of his wage on manufactures, and his utility function is given by \( c_A^{1-\theta} [nC_M^\theta]^{\theta/\alpha} \), where \( c_A \) is consumption of the agricultural good and \( c_M \) is consumption of a typical differentiated good (symmetry being assumed), his real wage can be written as \( [\theta^\theta / (1-\theta)^{1-\theta}]wp^{-\theta} n^{\theta(1-\alpha)/\alpha} \). Here, as before, \( w \) denotes the wage in terms of the agricultural good and \( p \) is the relative price of manufactures in terms of the agricultural good. For given \( w \) and \( p \), we see that the real purchasing power of the worker—the wage in terms of the whole basket of goods consumed by the worker—is increased. If we think of the worker’s subsistence wage as being given by \( [\theta^\theta / (1-\theta)^{1-\theta}]wp^{-\theta} n^{\theta(1-\alpha)/\alpha} \), since he consumes both corn and manufactures, and note that intraindustry trade leaves \( p \) unchanged but raises \( n \), the value of \( w \) required to achieve a given level of subsistence wage is now reduced under pure intraindustry trade. Since the rate of profit is given by \( r_t = [p_t \alpha a_M - w]/w \), and now \( w \) falls with \( p_t \) unchanged, we see straightforwardly that intraindustry trade is capable of raising the profit rate through the wage channel.\(^5\)

\(^5\)For analytical completeness, it should be pointed out that, in theory, there is another mechanism through which pure intraindustry trade can affect the rate of profit other than through the lowering of workers’ wages in terms of agriculture just studied in this section. This mechanism works through the decreased markups of imperfectly competitive firms under intraindustry trade. If increased foreign competition leads firms to reduce their markups, labor would be drawn out of the agricultural sector to work in the manufacturing sector at given \( p \). This raises the profit rate. Fuleihan (1990) modeled a theory of endogenous markups by drawing upon the variable elasticity of demand adopted by Krugman (1979) in the context of Ricardo’s Essay model to examine the growth and income distributional effects of customs unions.
References


