

# Ricardo's Numerical Example Versus Ricardian Trade Model: a Comparison of Two Distinct Notions of Comparative Advantage

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## Abstract

The so-called *Ricardian* trade model of contemporary economic textbooks is not a rational reconstruction of Ricardo's famous numerical example in chapter seven of the *Principles*. It differs from the latter in terms of the definition of the four numbers, relevant cost comparison, rule for specialisation, assumptions and theoretical implications. Thus, the widespread critique regarding the unrealistic assumptions of the textbook trade model does not apply to Ricardo's original proof of comparative advantage.

**Keywords:** comparative advantage, David Ricardo, Ricardian trade model, international trade theory, free trade

**JEL-Codes:** B12; F10

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## 1. Introduction

“Classic”. A book that people praise and don't read' (Mark Twain).

The so-called Ricardian model of comparative advantage, or simply the Ricardian trade model, has been a main target in recent publications criticising the mainstream case for free trade.<sup>2</sup> The selection of this target by opponents of free trade is perfectly understandable. After all, this basic international trade model featuring two countries, two products and one factor of production (labour) is said to explain, all by itself, the virtuous of free trade and the optimal pattern of international trade. Comparative advantage has indeed been the economists' favourite argument against protectionism during the last 150 years.

Despite the unrelenting popularity of the Ricardian trade model within the economic profession, the relatively small but growing faction of critics of this trade model does not have to fear a fierce backlash from their colleagues. After all, most economists are willing to concede that it is built upon some unrealistic assumptions. Not surprisingly, the critics' main line of attack has centred precisely on this weak spot.<sup>3</sup> They argue that the conclusions extracted from the trade model are only valid within the narrow confines of its unrealistic

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<sup>2</sup> See Reinert (2007) for a particularly fierce attack on Ricardo's theory of comparative advantage.

<sup>3</sup> Baiman (2010) takes a different approach. He accepts the assumptions of the basic classical model, but intends to demonstrate that its free trade conclusion is logically inconsistent. He fails to do so because he erroneously believes that Ricardo assumed that the quantity of cloth and wine produced in England and Portugal are equal, and misinterprets other aspects of Ricardo's numerical example as well.

assumptions. In the real world, however, the potential gains suggested by the trade model may well prove illusory. A few critics have gone as far as recommending the dismissal of the whole theory of comparative advantage, which they consider out-dated and deeply flawed.<sup>4</sup>

It is not my intention here to come to the rescue of the Ricardian trade model. In fact, I mostly agree with the critique directed against this trade model in recent years. My contention is rather that the critique has been unfairly extended to Ricardo, because most scholars do not distinguish accurately between the numerical example in chapter 7 of his magnum opus *On the Principles of Political Economy and Taxation* (1817) and the trade model of contemporary economic textbooks. Indeed, most critics do not make any distinction at all between the two.<sup>5</sup> A few others, while acknowledging some minor differences, fail to realise that Ricardo's original proof of comparative advantage does not require any of the unrealistic assumptions of the textbook trade model.<sup>6</sup> A third group of scholars wrongly claim that at least a few of the criticised assumptions can also be found in the *Principles*.<sup>7</sup>

The prevalent practice of designating the textbook trade model as *Ricardian* stands in the way of an accurate distinction between the two.<sup>8</sup> This misnomer has certainly misled many economists into thinking that the textbook trade model they encountered during their undergraduate studies was a sort of modern translation or rational reconstruction<sup>9</sup> of the famous numerical example in the *Principles*. Most of them still cling to this.

I am aware that the chances of altering the mainstream interpretation of a famous theory are slim. It is a challenging task even for a Nobel-laureate economist like George Stigler, who once offered the following explanation for the difficulty of correcting the widespread misinterpretation of Ricardo's labour theory of value:

'The basic reason Ricardo's theory is often misinterpreted is that it was often misinterpreted in the past. If a theory once acquires an established meaning, each generation of economists bequeaths this meaning to the next, and it is almost impossible for a famous theory to get a fresh hearing' (Stigler 1958, p. 367).

The very same can be said with respect to Ricardo's famous numerical example. Only that in this case the likelihood of getting a fresh hearing might be even slimmer, since the proposed correction to the theory of comparative advantage affects the main building blocks of international trade theory (Faccarello, 2015, p. 754). Many scholars even consider comparative advantage as one of the crown jewels of the economic profession (Rodrik 1998, p. 3). Looking at the growing number of critics of the textbook trade model, though, it is imperative to submit the mainstream interpretation of comparative advantage to a thorough review. The most famous numerical example in the economic science seems to be in desperate need of a fresh hearing.

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<sup>4</sup> See, for example, Schumacher (2013).

<sup>5</sup> See Driskill (2012), Gonzalez (2006), Prash (1996), Felipe and Vernengo (2002), Reinert (2007), Skarstein (2007) and Bouare (2009), in no particular order.

<sup>6</sup> See, for example, Fletcher (2011).

<sup>7</sup> See Duffield (2010) and Schumacher (2013).

<sup>8</sup> This longstanding tradition has remained unaltered until the very present, as a brief look into today's most popular textbooks on international economics reveals (Carbaugh 2008; Krugman et al. 2012; Feenstra and Taylor 2014; Thompson 2011 and Salvatore 2013).

<sup>9</sup> Mark Blaug (2001) describes the concept of rational reconstruction as an exercise of '...dressing up past ideas in modern garb, often in the form of mathematical models that look just like something that might have appeared in the latest issue of the *American Economic Review* or the *Journal of Political Economy*' (p. 150).

Luckily, the present paper is not the first in recognising that the textbook trade model differs from Ricardo's numerical example.<sup>10</sup> Well-known popularisers of the correct interpretation of the four numbers in the *Principles* – like Roy Ruffin and Andrea Maneschi – have already highlighted some differences regarding the terms of trade (Ruffin, 2002), the calculation of the gains from trade (Maneschi, 2004) and the degree of specialisation (Maneschi, 2008). John Pullen (2006) also preceded this paper in making a comparison between Ricardo's statement of comparative advantage and the Ricardian trade model, which he refers to as the 'modern version of the law of comparative advantage'. Although I agree with Pullen's conclusion that Ricardo did not conceive the comparative-advantage proposition as an economic law that determines international specialisation and the geographical location of industries,<sup>11</sup> I disagree with his interpretation of the purpose and content of the numerical example in the *Principles*. Neither of the two propositions Ricardo announced and proved there – the non-appliance of the labour theory of value in international exchanges and comparative advantage – were intended as a practical guide or a piece of commercial advice for commodity traders, as Pullen (2006, p. 60) suggests.

Notwithstanding these occasional recognitions of some important differences between Ricardo's numerical example and the textbook trade model, most economists still consider the latter as an accurate, rational reconstruction of the former. Even Ruffin and Maneschi hold tenaciously to this view. Ruffin (2002) declared in his influential paper that 'it is important to begin with a modern statement of Ricardo's law of comparative advantage to fully appreciate Ricardo's own statement' (p. 729), while Maneschi (2008) suggested that Ricardo would have explained comparative advantage quite differently had he known the standard tools and graphical techniques of neoclassical economics. Both seem to be more interested in reconciling Ricardo's original proof of comparative advantage with modelling assumptions and analytical results of neoclassical trade theory than in highlighting the significant differences and incompatibilities with respect to the textbook trade model.<sup>12</sup>

A central purpose of this paper is to end the mistaken association of Ricardo with neoclassical assumptions and analytical results by demonstrating that the textbook trade model cannot be considered as an accurate rational reconstruction of his original numerical example. To fundament this assertion, I will highlight some essential differences between them, putting emphasis on the distinct set of assumptions. The highlighted differences have been overlooked until now because of the enduring practice of interpreting Ricardo's numerical example almost exclusively through the lenses of the textbook trade model. In a deliberate break with this tradition, the paper will take as point of departure what he wrote in the *Principles*, while putting aside as much as possible the features associated with the mainstream notion of comparative advantage. Furthermore, I will explain how the misinterpretation of the relationship between comparative advantage and the labour theory of value led to crucial reformulations of Ricardo's original proof during the 1920s and 1930s. This novel methodological approach allows for a sharper distinction between the numerical example in the *Principles* and the textbook trade model, which is perhaps the most important accomplishment of the present paper with respect to its predecessors.

The paper is structured as follows. It starts with a summary of the original purpose and content of Ricardo's numerical example. The next section is devoted to highlighting the main differences between the numerical example in the *Principles* and the textbook trade model of comparative advantage. Besides the diverging definitions of the four numbers, they

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<sup>10</sup> See Parrinello (1988) for an early attempt of distinguishing between Ricardo and the Ricardian trade model.

<sup>11</sup> See also Aldrich (2004).

<sup>12</sup> See also Gehrke (2015).

also feature different rules for specialisation, which in some cases suggest opposing conclusions regarding the beneficial nature of an exchange. The following section shows that three well-known assumptions of the textbook trade model are not required in Ricardo's original proof of comparative advantage. After briefly mentioning a few commonalities, the last section before the conclusions analyses the main advantages of Ricardo's numerical example over the textbook trade model.

## 2. An Accurate Interpretation of Ricardo's Numerical Example

Ricardo announced in chapter seven of the *Principles* that 'the same rule which regulates the relative value of commodities in one country, does not regulate the relative value of the commodities exchanged between two or more countries' (Vol. 1, p. 133). Thus, he explicitly limited the validity of his labour theory of value to exchanges within national borders. A few paragraphs later, Ricardo proceeded to illustrate this proposition with a simple numerical example featuring the exchange of English cloth and Portuguese wine. In accordance with the announced proposition, he stated:

'The quantity of wine that she [Portugal] shall give in exchange for the cloth of England, is not determined by the respective quantities of labour devoted to the production of each, as it would be, if both commodities were manufactured in England, or both in Portugal' (Vol. 1, pp. 134-135).

The four numbers in the famous example should be correctly interpreted as the quantity of men working for a year required to produce some unspecified amounts of cloth and wine traded between England and Portugal.<sup>13</sup> This accurate interpretation of the four numbers debunks charges of logical inconsistency and incompleteness made by scholars who misinterpreted them as quantities of labour necessary to produce a single unit of cloth and wine in the two countries.<sup>14</sup>

Moreover, Ricardo selected the four numbers quite smartly so he could also demonstrate that 'this exchange might even take place, notwithstanding that the commodity imported by Portugal could be produced there with less labour than in England' (Vol. 1, p. 135). England saves the labour of 20 men working for a year by importing the wine from Portugal instead of producing it internally, while Portugal gains the labour of 10 men by importing the cloth. Therefore, each country has an interest, completely independent from the other, in the featured exchange. With an astonishingly simple numerical example, thus, Ricardo managed to prove that a country might import a certain quantity of a commodity although it could produce it internally with less amount of labour time than the exporting country, and that such an exchange would be beneficial for both trading partners. In close correspondence with what is written in the *Principles*, the term 'comparative advantage' will be used as a shorthand expression for this proposition throughout the paper.

Undoubtedly, Ricardo's numerical example became so famous afterwards because of this ingeniously simple proof of comparative advantage. Notwithstanding, strong evidence suggests that Ricardo himself considered the proposition regarding his value theory as the

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<sup>13</sup> In recent years Ruffin (2002) has been quite successful in spreading the correct interpretation of the four numbers, after previous attempts were largely ignored by most scholars. Back in 1930 Sraffa already presented a table in which Ricardo's four numbers were defined as 'number of men whose labour is required for one year in order to produce a given quantity of cloth and wine' (Sraffa, 1930, p. 541).

<sup>14</sup> See, for example, Chipman (1965, p. 479).

main insight he wanted to illustrate with the exchange of English cloth and Portuguese wine. First, the so-called comparative-advantage section<sup>15</sup> in the *Principles* actually starts with the value proposition, and approximately half of the section is dedicated to explain the assumption of relative capital-immobility between countries, which Ricardo identifies as the main cause for the non-appliance of the labour theory of value in international exchanges;<sup>16</sup> second, this interpretation offers a plain explanation for why Ricardo only compared labour-time requirements in the numerical example; third, immediately after illustrating that the relative value of commodities exchanged between two or more countries is not regulated by the respective amounts of labour time necessary for their production, Ricardo announces a rule for price-determination in international transactions;<sup>17</sup> and last but not least, it would have been simply impossible for him to prove the comparative-advantage proposition in a mutually beneficial exchange without contradicting his labour theory of value.<sup>18</sup>

I have already illustrated the last affirmation in a previous paper using specific numbers.<sup>19</sup> Since the role of the value proposition in Ricardo's numerical example is still the subject of debate among scholars,<sup>20</sup> it might be necessary here to demonstrate in a more general way – that is, for any combination of numbers – that one cannot prove the comparative-advantage proposition in a mutually beneficial exchange within the framework of the labour theory of value. For this purpose, let us reformulate Ricardo's numerical example using parameters as labour-time requirements instead of specific numbers. England is exporting a certain amount of cloth to Portugal in exchange for a certain amount of wine. The parameters  $C_e$ ,  $W_e$ ,  $C_p$  and  $W_p$  indicate the number of men working for a year required to produce these unspecified amounts of cloth and wine traded in the respective countries.

**Table 1** A general formulation of Ricardo's numerical example.

	<b>Cloth</b>	<b>Wine</b>
<b>England</b>	$C_e$	$W_e$
<b>Portugal</b>	$C_p$	$W_p$

For England to be interested in importing a certain quantity of wine from Portugal in exchange for some quantity of cloth, the exchange must satisfy the classical rule for specialisation.<sup>21</sup> This rule stipulates that the amount of labour time embodied in the quantity of cloth exported

<sup>15</sup> According to Sraffa, (Vol. 1, Introduction, xvii), this section starts in page 133 (third paragraph) and ends in page 137 (first paragraph).

<sup>16</sup> See also Ruffin (2002, p. 734).

<sup>17</sup> He stated: 'Cloth cannot be imported into Portugal, unless it will sell there for more gold than it cost in the country from which it was imported; and wine cannot be imported into England, unless it will sell for more there than it cost in Portugal' (Vol. I, p. 137).

<sup>18</sup> It seems that Ricardo was aware of this, as he wrote in the paragraph immediately after the numerical example: 'Thus England would give the produce of the labour of 100 men, for the produce of the labour of 80. Such an exchange could not take place between the individuals of the same country. The labour of 100 Englishmen cannot be given for that of 80 Englishmen, but the produce of the labour of 100 Englishmen may be given for the produce of the labour of 80 Portuguese, 60 Russians, or 120 East Indians. The difference in this respect, between a single country and many, is easily accounted for, by considering the difficulty with which capital moves from one country to another, to seek a more profitable employment, and the activity with which it invariably passes from one province to another in the same country' (Vol. 1, pp. 135-136).

<sup>19</sup> See Morales Meoqui (2011, pp. 754-755).

<sup>20</sup> See, for example, Faccarello (2015, pp. 762-764).

<sup>21</sup> This rule is also known in the economic literature as the '18<sup>th</sup>-century rule'. In a previous paper (Morales Meoqui, 2011, p. 747) I have argued against the use of this misleading denomination coined by Viner (1937, p. 440).

( $C_e$ ) should be less than the amount of labour time required for the internal production of the imported quantity of wine ( $W_e$ ), or  $C_e < W_e$ . For Portugal also to gain from this exchange, the condition  $W_p < C_p$  must be fulfilled. For the featured international exchange to continue over a prolonged period, the classical rule for specialisation must be fulfilled in both countries simultaneously.

If the labour theory of value would regulate the relative value of these commodities, the amount of labour time embodied in the respective quantities of cloth and wine traded would have to be the same, or  $C_e = W_p$ . Making the corresponding substitutions in the two inequalities mentioned in the above paragraph, we obtain  $W_p < W_e$  and  $C_e < C_p$ .

To prove the proposition that Portugal would import a certain quantity of cloth from England even though it could produce the cloth internally with less labour time, however, it must be that  $C_p < C_e$ . Therefore, if both countries were to gain from this exchange, Ricardo could not have proven the comparative-advantage proposition without contradicting his value theory. Thus, the proposition about the non-appliance of the labour theory of value in international trade is indeed crucial for the logical construction of Ricardo's numerical example.

Contrary to what many believe nowadays, Ricardo's insights do not refute the notion that a foreign commodity must be cheaper than a domestic commodity of similar quality to get imported. This intuitive notion remains valid, as Ricardo himself stated: 'The motive which determines us to import a commodity, is the discovery of its relative cheapness abroad: it is the comparison of its price abroad with its price at home' (Vol. I, p. 170). The confusion in this respect may have originated because most explanations of comparative advantage in today's economic textbooks completely omit to mention Ricardo's proposition about the non-appliance of the labour theory of value in international exchanges. If the law of value would regulate international exchanges, the English cloth embodying the labour time of 100 men would have to have a higher exchange value, and presumably also superior money costs of production, than the Portuguese cloth – which contains the labour of only 90 men. In that case, however, the pricier English cloth would not be exported to Portugal. Since the law of value does not apply to exchanges between countries, though, one cannot presume that higher labour-time requirements necessarily imply superior money costs of production.

This summary of the purpose and content of Ricardo's numerical example follows rather closely what is written in the *Principles*. Notwithstanding, some aspects of this resume may sound quite unfamiliar to those who have learned the concept of comparative advantage from contemporary economic textbooks instead of the original source. The significant differences between Ricardo's numerical example and the textbook trade model are the result of a debate among economists about the content and validity of the theory of comparative advantage during the 1920s and 1930s. This debate was very much influenced by crucial misinterpretations of the numerical example in the *Principles*, which led the participants to propose significant alterations to Ricardo's original proof of comparative advantage, as the following section will show.

### **3. Three Major Differences Between Ricardo's Numerical Example and the Ricardian Trade Model**

#### **3.1 Diverging Definitions of the Four Numbers**

The most obvious difference between Ricardo's numerical example and the typical textbook trade model is of course the definition of the four numbers. They are defined in the textbook

trade model as the quantities of labour required for producing a single unit of cloth and wine in the respective countries. During the 1920s and 1930s many influential economists erroneously believed that this definition of the four numbers also corresponded to the famous example in the *Principles*.<sup>22</sup>

Taking unit labour-time requirements as basis for the numerical proof of comparative advantage has an immediate implication: one must assume that they remain constant irrespective of the amounts of commodities produced. Otherwise, it would be impossible to calculate the respective quantities of labour time embodied in the commodities exchanged, since countries usually trade more than a single unit of any commodity in a typical trade bundle. Without this calculation, though, one cannot estimate the gains from trade to ascertain whether a country should import a certain quantity of a commodity rather than produce it internally.

The assumption of constant unit labour-time requirements ended up being wrongly attributed to Ricardo because of the longstanding and widespread misinterpretation of the four numbers in the *Principles*. As I have already argued in previous occasions,<sup>23</sup> though, this unrealistic assumption is completely alien to Ricardo's economic theory. In fact, he explicitly indicated in the *Principles* that the alterations in the quantity of labour necessary to produce commodities are often of daily occurrence. This is precisely why he considered the great variations in the relative value of commodities to be produced mostly – although not exclusively – by the greater or less quantity of labour which may be required from time to time to produce them (Ricardo, Vol. 1, pp. 36-37).

### **3.2 Different Rules for Specialisation**

In the numerical example in the *Principles* it is clear which numbers Ricardo compared to determine whether the featured exchange of cloth and wine is in the best interest of each of the participating countries. For that purpose, he made an internal comparison of labour-time requirements, comparing the quantity of labour embodied in the commodities that a country must export to pay for the imported commodities, and the estimated quantity of labour required to produce the imports internally. Whenever the former is less than the latter, the exchange would be beneficial for the country. This explains why he proclaimed England's interest in exporting cloth and importing wine before even mentioning Portugal's labour-time requirements (Vol. 1, p. 135).

Ricardo did not invent the above rule for specialisation. It was repeatedly used for determining the beneficial nature of a barter trade well before the publication of the *Principles*, and continued to be used for this purpose after 1817 as well. To highlight its prominent role throughout the heyday of classical political economy, I have proposed to call it the *classical rule for specialisation*. This rule, though, is less conclusive for determining the beneficial nature of a barter trade when the four numbers are defined as unit labour-time requirements, and the exchange rate between cloth and wine is not specified, as it is often the case in textbook trade models. The mere fact that in England it may require less quantity of labour to

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<sup>22</sup> Gottfried von Haberler (1936), for example, begins his analysis of the theory of comparative cost by asserting the following: 'In chapter VII of his *Principles* he [Ricardo] gives the following celebrated example: In England a unit of cloth costs 100 and a unit of wine 120 units of labour; in Portugal a unit of cloth costs 90 and a unit of wine 80 units of labour' (p. 128). Jacob Viner (1937, p. 445) presents a table containing the same four numbers, described as the amounts of 'labor required for producing a unit' of cloth and wine in UK and Portugal. This misinterpretation of Ricardo's numbers proved to be quite enduring, since Samuel Hollander (1979) defined Ricardo's numbers more than 40 years later as follows: 'Input per unit of cloth and wine respectively – in terms of labour for one year – are supposed to be 100 and 120 in England; and 90 and 80 in Portugal' (p. 462).

<sup>23</sup> See Morales Meoqui (2011, pp. 757-759; and 2014, pp. 24-25).

produce a single unit of cloth than a bottle of wine is hardly a sufficient criterion for making the cloth there rather than importing it, unless one also assumes that the exchange ratio between the two commodities is always 1:1.<sup>24</sup>

Therefore, the misinterpretation of Ricardo's numbers made it necessary to find a new way of determining a country's comparative advantage. Echoing Haberler (1930, p. 352) and others, Viner argued that one should not compare costs but '*...ratios between costs*, and it is unessential whether the cost ratios which are compared are the ratios between the costs of producing different commodities within the same countries, or the ratios between the costs of producing the same commodities in different countries' (Viner 1932, p. 357). Thus, the comparison of cost ratios led to a legitimization of the external cost comparison, although Ricardo regarded the latter as irrelevant for determining the beneficial nature of a barter trade between countries.<sup>25</sup>

From that moment on until the very present, the comparison of cost ratios has been the predominant method for determining the comparative advantage of a country in the economic literature.<sup>26</sup> Under this method England must know Portugal's labour-time requirements to find out its own comparative advantage, and *vice versa*. This is also expressed quite clearly in the corresponding rule for specialisation derived from the comparison of cost ratios. According to this rule, each country 'exports the good in which it has the smallest absolute disadvantage or the largest absolute advantage' (Ruffin 2005, p. 718). Likewise, Felipe and Vernengo (2002, p. 51) stated: 'The first nation should specialize in the production and export of the commodity in which its absolute disadvantage is smallest (this is the commodity in which it has a comparative advantage) and import the commodity in which its absolute disadvantage is greater (this is the commodity of its comparative disadvantage).' Like in the case of other exclusive features of the textbook trade model, this rule for specialisation ended up being wrongly attributed to Ricardo.<sup>27</sup>

At first sight, it seems that the substitution of the classical rule used by Ricardo in the numerical example with the textbook rule for specialisation derived from the comparison of cost ratios has no practical consequences for the determination of comparative advantage and the beneficial pattern of trade, because both rules yield the same result when applied to the original four numbers in the *Principles*. Portugal has indeed a greater advantage in the production of wine – a 40 men advantage in wine compared to only 10 men in cloth – whereas England has a smaller disadvantage in cloth. Thus, the textbook rule coincides with the recommendation made by the classical rule for specialisation that Portugal should produce the wine and England the cloth traded.

Despite this coincidence, both rules cannot be considered as logically equivalent for the determination of comparative advantage and beneficial trade patterns, since their respective recommendations may differ under a different set of numbers. To illustrate this with the least possible alteration to Ricardo's original numerical example, let us suppose that England discovers a process of making wine that reduces the quantity of men working for a year required to produce the amount of wine traded from 120 men to just 95 men. Portugal's labour-time requirements remain the same, as it is shown in table 2.

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<sup>24</sup> Viner (1932, p. 363) indeed believed that Ricardo set the exchange ratio at one cloth for one wine.

<sup>25</sup> See Ricardo (Vol. 2, p. 383).

<sup>26</sup> According to Maneschi (2008), 'the fact that  $80/120 < 90/100$  shows that Portugal has a comparative advantage in wine and hence will exchange wine for cloth when trade begins' (p. 1168).

<sup>27</sup> According to Reinert (2007), 'Ricardo attempted to prove that it could still be mutually beneficial for both countries to specialise and trade if each country specialised where it was relatively most efficient (or less inefficient) compared to the other country' (Appendix 1).



**Table 2:** A modified version of Ricardo's numerical example

	Cloth	Wine
England	100	95
Portugal	90	80

Portugal can still produce both the cloth and wine traded with less quantity of labour than England, and continues to be interested in the export of wine to this country, irrespective of whether one applies the classical rule for specialisation ( $90 - 80 = 10$ ) or the comparison of cost ratios suggested by the textbook trade model ( $80/95 < 90/100$ ). England's disadvantage is still smaller in the production of cloth, but is it in her interest to import the wine from Portugal, as the textbook rule for specialisation suggests? Ricardo would surely disagree, because England could save the labour of 5 men by starting to produce the wine internally.

I decided to modify England's labour-time requirements for producing wine because Ricardo himself wrote about this possibility in the *Principles*.<sup>28</sup> If one increases the quantity of labour required to produce the wine in Portugal to 95 men while leaving the other three original numbers in the *Principles* unchanged, the country would still have a greater advantage in the production of wine ( $120 - 95 = 25$  men) compared to cloth ( $100 - 90 = 10$  men) with respect to England. The comparison of cost ratios would also show that  $95/120 < 90/100$ , so according to the textbook rule, Portugal should import the cloth from England. This recommendation, though, is clearly at odds with the one derived from the classical rule for specialisation. Ricardo would consider this exchange to be detrimental to Portugal, because she could save the labour of five men by starting to produce the cloth internally instead of importing it from England.

As has been shown above, thus, the rule for specialisation championed by the textbook trade model may recommend a different pattern of specialisation than the classical rule used by Ricardo in the numerical example. The importance of this new finding cannot be overstated. It means that the notion of comparative advantage currently propagated by the textbook trade model is different from Ricardo's.

Moreover, this finding deals a deathblow to the widespread belief that the textbook trade model is merely a modern version of the original numerical example. To counter this finding, though, defenders of this view may refer to a well-known footnote in the *Principles* which states:

'It will appear then, that a country possessing very considerable advantages in machinery and skill, and which may therefore be enabled to manufacture commodities with much less labour than her neighbours, may, in return for such commodities, import a portion of the corn required for its consumption, even if its land were more fertile, and corn could be grown with less labour than in the country from which it was imported. Two men can both make shoes and hats, and one is superior to the other in both employments; but in making hats, he can only exceed his competitor by one-fifth or 20 per cent., and in making shoes he can excel him by one-third or 33 per cent.;— will it not

<sup>28</sup> See Ricardo (Vol. 1, p. 137). Thus, the legitimate critique regarding the static approach of the textbook trade model of comparative advantage cannot be extended to Ricardo. As a matter of fact, his notion of comparative advantage can be easily integrated into Smith's dynamic framework of international trade (Morales Meoqui, 2014).

be for the interest of both, that the superior man should employ himself exclusively in making shoes, and the inferior man in making hats?' (Vol. 1, p. 136n.)

The above footnote should not be considered as Ricardo's best claim for having formulated the principle of comparative advantage, as Aldrich (2004, p. 389) erroneously states. It rather owes its popularity to the fact that it is one of the few passages of the *Principles* that can be cited in support of the claim that the textbook notion of comparative advantage is similar to Ricardo's. This is precisely why some prominent supporters of this claim tend to overstate its importance.<sup>29</sup> The alleged link between the footnote and the textbook trade model is not in the first sentence, as Pullen (2006, p. 66) indicates, but in the second sentence, starting with 'Two man can...', and where Ricardo appears to suggest that one should specialise in the production of the commodity in which one enjoys the greatest productivity advantage. Let us try to answer Ricardo's rhetorical question with the help of a numerical example.

**Table 3:** A numerical example based on Ricardo's footnote

	1 hat	1 pair of shoes
Adam	4 hours	2 hours
David	5 hours	3 hours

According to the numbers in Table 3, Adam has a 20% (1-4/5) productivity advantage over David in making hats, and a 33% (1-2/3) productivity advantage in making shoes. Should Adam specialise in the production of shoes then? One cannot answer this question without knowing the relative value of hats and shoes. If Adam still requires two hours for producing a second pair of shoes, but must give more than two pairs of shoes to obtain one hat, he would be saving some labour time by making the hat instead of buying it from David.

Besides this footnote, there is not a single passage in the *Principles* that suggests that Ricardo pretended to abandon the classical rule for specialisation in favour of a new rule for international specialisation. If this were indeed his intention, then why would he relegate such an important announcement to a mere footnote? Ricardo believed that domestic and international exchanges are regulated by different value rules – not different rules for specialisation.

The original purpose of the footnote seems to be a different one. Ricardo probably anticipated that it would be quite difficult to convince some of his readers that it is indeed in Portugal's interest to import cloth although she could produce it with less quantity of labour than England. Thus, he wanted to indicate that one could already find traces of this proposition in the *Wealth of Nations*. Indeed, the first sentence of the footnote seems to refer to a paragraph (WN, I.i.4, p. 16) where Smith talks about the possibility that England might import some amount of corn from Poland despite having a productivity advantage over the latter in the production of corn. Smith explains this counterintuitive fact by pointing out that the productivity advantage of England over Poland is greater in manufactures than in agriculture, because the nature of agricultural production does not admit the same degree of subdivisions of labour than manufacturing. Therefore, Polish corn might compete in quality and cheapness with the corn from England or France, but Poland cannot aspire to compete with English or French manufactures, at least if the manufactures suit the soil, climate, and situation of the richer countries. The second sentence of Ricardo's footnote refers to Smith's example of the

<sup>29</sup> Ruffin (2002), for example, calls it a 'tremendous footnote' (p. 740).

shoemaker and the tailor (WN, IV.ii.11, pp. 456-457), as Sraffa already indicated in his edition of the *Principles*.

Ironically, the very same footnote which is so highly regarded by those who cling to the idea that the notion of comparative advantage propagated by economic textbooks is similar to Ricardo's, contains another significant difference between the two. The textbook trade model normally implies complete specialisation by each trading partner according to its comparative advantage, except for the special case when a country is relatively small and does not have the production capacity to satisfy the demand of its larger trading partner.<sup>30</sup> Yet Ricardo explicitly refers in the above footnote to partial specialisation. Even if a country were much more advanced in manufacturing than its neighbours, it might still satisfy part of its national demand for corn by internal production.

Explicit references to partial specialisation can also be found in the main text of the *Principles*. In page 134, for example, Ricardo states that 'if Portugal had no commercial connexion with other countries, instead of employing *a great part* of her capital and industry in the production of wines, with which she purchases for her own use the cloth and hardware of other countries, she would be obliged to devote a part of that capital to the manufacture of those commodities, which she would thus obtain probably inferior in quality as well as quantity' (Vol. I, p. 134; emphasis added). A few pages later Ricardo hints again at partial specialisation when he states: 'Now suppose England was to discover a process for making wine, so that it should become her interest rather to grow it than import it; she would naturally divert *a portion* of her capital from the foreign trade to the home trade; she would cease to *manufacture cloth for exportation*, and would grow wine for herself' (Vol. I, p. 137; emphasis added).

While complete specialisation might be a theoretical possibility in a very simple trade model where two countries exchange only two types of commodities, it is of course impossible once the trade model considers all the various articles which are normally traded. Complete specialisation by each trading partner means that every country would specialise in the production of a single type of commodity, for example cloth, and import all the other goods demanded by its residents. Thus, complete specialisation is a very unlikely outcome of free trade under realistic circumstances. Ricardo did not envision this analytical result of neoclassical trade theory, nor did he ever recommend it.

### **3.3 Comparative Advantage Determined by Opportunity Costs**

Despite the importance that Ricardo attributed to the non-appliance of the labour theory of value in international exchanges in the original numerical example, there is usually no reference to this proposition in the typical textbook trade model. The reason for this glaring omission is worth analysing here briefly.

During the 1920s several scholars claimed that Ricardo's theory of comparative advantage had to be rejected because of its alleged reliance on the labour theory of value, which they considered out-dated.<sup>31</sup> As an indication of this presumed dependency, they refer to the fact that Ricardo stated the costs in his numerical example as units of labour-time. In this context, Austrian economist Gottfried von Haberler tried to tackle the criticism – which he considered to be valid – by replacing Ricardo's labour-time requirements with opportunity

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<sup>30</sup> I'm thankful to Andrea Maneschi for drawing my attention to this special case.

<sup>31</sup> See, for example, Knight (1924) and Mason (1926).

costs (Haberler, 1930). According to Haberler's reformulation, a country is said to have a comparative advantage in the commodity whose production entails lower opportunity costs.<sup>32</sup>

Bearing in mind the accurate interpretation of Ricardo's numerical example from the previous section, it is clear now that all the participants in this odd debate – both Haberler as well as the critics – were wrong. The actual relationship between comparative advantage and the labour theory of value is in fact the opposite of what they presumed. Ricardo formulated his numerical example to illustrate that his value theory is not valid for international exchanges. As I have shown before, under the postulates of the labour theory of value it is impossible to prove the comparative-advantage proposition if the featured exchange had to be also mutually beneficial. Therefore, Baldwin (1982) and Bernhofen (2005) have wrongly portrayed Haberler as the economist who freed the theory of comparative advantage from its association with the labour theory of value. Haberler's alleged accomplishment was in fact a flawed response to an unfounded critique of the original proof of comparative advantage.

Over time, the specific reason and context that led to the reformulation of Ricardo's four numbers in terms of opportunity costs, was of course forgotten. And since the reformulated numerical example continued to be named after Ricardo, it was almost inevitable that the determination of comparative advantage based on opportunity costs ended up being associated with him.<sup>33</sup> Among the many misconceptions surrounding the famous numerical example today, this erroneous association is particularly ludicrous. It overlooks the fact that the opportunity costs approach was originally developed by Austrian economist Friedrich von Wieser as part of his marginal theory of value. Wieser explicitly conceived his value theory as an opposing view and main alternative to Ricardo's labour theory of value. It says a lot about the current state of the economic science when nowadays one of the most influential thinkers in the history of economic thought is mostly remembered for an international trade model that is based on a rival conception to his own theory of value.

#### **4. Three Diverging Assumptions**

Ricardo's numerical proof of comparative advantage is based on a different logical construction and theoretical foundation than the textbook trade model. It is therefore not very surprising to find out that his proof does not require most of the model's assumptions. Unfortunately, this fact is often overseen by those who do not distinguish properly between the two. Therefore, they often censure Ricardo for making unrealistic assumptions that belong rather exclusively to the textbook trade model. Since these assumptions are nowhere to be found in the *Principles*, the critics often suggest that Ricardo made them rather implicitly.<sup>34</sup> The truth of the matter is that he simply did not need them. In the previous section I have already mentioned that Ricardo neither assumed constant unit labour-time requirements, nor did he argue that a country would end up completely specialised in the production of a single type of commodity. In this section I will refer briefly to three additional assumptions of the textbook trade model which are wrongly attributed to Ricardo. Since the list of assumptions of

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<sup>32</sup> Bernhofen (2005) states: 'Haberler's new idea was to reformulate the theory of comparative advantage such that the value of good X is measured in terms of the forgone units of the production of good Y rather than the labor units that are necessary to produce good X, as in the Ricardian formulation' (pp. 997-998).

<sup>33</sup> See, for example, Schumacher (2013).

<sup>34</sup> Viner's following remark is typical for this unfounded imputation: 'Ricardo's illustration implies a number of important assumptions which, in conformity with his usual practice, he never expressly states' (Viner 1932, p. 362).

the textbook trade model is quite long, it is not possible to analyse here every single one of them. Instead, I will concentrate on the most popular ones.

#### **4.1 Zero transportation costs**

It is widely acknowledged, for example, that the textbook trade model assumes zero transportation costs.<sup>35</sup> This is indeed a necessary assumption if one takes unit labour-time requirements as basis for the numerical proof of comparative advantage, and further assumes that they remain constant. Taking transportation costs into account would infringe this assumption, since the cost of carriage per unit usually decreases the more commodities are transported in a single lot. To assume that the transportation costs per unit also remain constant would defy the most elementary notion of reality. Ricardo's proof of comparative advantage is not affected by these problems, though, since he did not assume constant unit labour-time requirements.

The attribution of the zero-transportation-costs assumption to Ricardo seems to rely on the claim that he allegedly did not mention them in the numerical example. This claim is false, since he does in fact mention the cost of conveyance in page 136, and at least twice in the rest of the chapter *On Foreign Trade*.<sup>36</sup> Since the cost of transportation is usually accounted for in the respective values of the commodities exchanged in the barter trade, there was no need for Ricardo to keep mentioning them on every occasion. This means that he succeeded in integrating the cost of carriage between England and Portugal into the numerical example without any of the complications that Viner (1932, p. 373ff.) referred to.

#### **4.2 Full-Employment of the Factors of Production**

Another well-known assumption of the textbook trade model refers to the full employment of the factors of production. This assumption, for example, would preclude the existence of unemployed labour.<sup>37</sup> It was introduced by Haberler's reformulation of the four numbers as opportunity costs, since it is an essential part of this approach. It is not required, though, in Ricardo's proof of comparative advantage.

For demonstrating the absurdity of the claim, let us suppose for a moment that Ricardo assumed that no English and Portuguese labourers were unemployed when the exchange takes place. He should have noticed then that neither England nor Portugal would have had the required number of labourers available for producing internally the quantities of cloth and wine traded. The 100 English men which are currently making cloth for exportation could be reassigned to the wine production, but England requires 120 men to produce the demanded quantity of wine. Portugal requires 90 men for producing the cloth but had only 80 men available. Under the assumption of full employment, thus, both countries would have had no option but to procure the demanded quantities of cloth and wine from abroad.

Even if there were 10 Portuguese men unemployed, it would make no sense from an economic point of view to start producing cloth in Portugal with the labour of 90 men if it can be purchased from England with the exportation of wine that requires the labour of only 80 men. Instead of employing them in the production of cloth, why not deploy 10 additional men in the production of the wine exported to England? Because it would be inefficient to use the labour of 90 men when only 80 men are required? Well, it is equally inefficient to make cloth that can be procured with less quantity of labour from abroad. After all, trade is just an indirect

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<sup>35</sup> See, for example, Reinert (2007).

<sup>36</sup> On pages 133 and 144.

<sup>37</sup> See, for example, Felipe and Vernengo (2002, pp. 54-55).

method of production. Portugal can only increase the number of goods and services available for consumption by deploying the 10 men in other occupations.

The same can be said of course about the 20 men's labour saved in England. In fact, more than 100 years before Ricardo published the *Principles*, the English journalist Henry Martyn<sup>38</sup> had already argued in his *Considerations on the East-India Trade* (1701) that it is not wise to produce with the labour of many what can be procured from abroad with the hands of a few. To refute the mercantilists' argument that England was losing employment opportunities by importing cloth from India, Martyn formulated theoretical examples in which he applied the classical rule for specialisation to show that no productive employment would be lost by this exchange.

The claim that Ricardo assumed full employment of capital is equally ludicrous, considering his definition of the term 'capital' in the *Principles*. For Ricardo, 'capital is that part of the wealth of a country which is employed in production, and consists of food, clothing, tools, raw materials, machinery, &c. necessary to give effect to labour' (Vol. 1, p. 95). In correspondence with this definition, commodities can only turn into capital when they are employed in the production process. This means of course that Ricardo would not consider them as capital if they remain idle. Therefore, the claim that he always considered capital to be 'fully employed' is both formally correct but completely redundant. It is rather a perfect example for a neoclassical assumption that makes no sense whatsoever in classical political economy.

#### **4.3 Perfect Internal Mobility of the Factors of Production**

Ricardo's numerical example does not require another well-known assumption of the textbook trade model: that of perfect internal mobility of the factors of production. Like the previous one, this assumption was also introduced by Haberler's redefinition of the four numbers as opportunity costs. To provide some legitimacy to such an unrealistic assumption, though, it has often been attributed to Smith or Ricardo. A careful consultation of the *Wealth of Nations* and the *Principles* proves that neither of them assumed perfect internal mobility of capital and labour. On the contrary, they were quite concerned about the negative consequences of any sudden short-term adjustment in international trade. Both recognised that in that case capital owners may have sunk (irrecoverable) costs and workers may find it hard to get new jobs at equivalent pay. Thus, they advocated in favour of granting protection on a temporary basis in order to spread the expected negative impact on certain groups over a longer period of time. Ricardo stated these views quite clearly in chapter XIX of the *Principles* titled 'On Sudden Changes in the Channels of Trade'.

Despite their concern about the negative impact that any sudden change in the general conditions of trade might have on some capital owners and workers, both Smith and Ricardo remain staunch supporters of free trade. After all, capital owners may retrieve most of their capital from the affected sectors, and many displaced workers might find employment elsewhere. To assume perfect internal immobility of the factors of production, that is, all capital is lost and every displaced worker remains unemployed forever, would be as unrealistic as the opposite assumption of perfect mobility.

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<sup>38</sup> MacLeod (1983) convincingly proved that Henry Martyn was the author of the anonymous pamphlet.

## 5. A Few Commonalities between Ricardo's Numerical Example and the Textbook Trade Model

Given the significant differences between Ricardo's numerical example and the textbook trade model highlighted so far, one might wonder at this point if there are any common features at all. There are indeed a few. It goes without saying, for example, that both offer a numerical proof for the proposition that a country might import some quantity of a commodity even though it could produce it internally with less amount of labour time than the exporting country. It is also true that both only refer to labour time requirements. Finally, both Ricardo's numerical example and the textbook trade model assume at least some degree of international capital immobility. But even among these common features one can find significant nuances between the two.

It has been often criticised that the textbook trade model only takes one factor of production – labour – into account. This critique, though, does not apply to Ricardo. There are, in fact, plenty of references to capital in the paragraphs surrounding the numerical example in the *Principles*. Ricardo even explains the non-validity of the labour theory of value in international exchanges by the relative immobility of capital between countries. Since the main purpose of the numerical example was precisely to illustrate this value proposition, it made perfectly sense for him to only compare the labour-time requirements in the respective countries. The formulation of an international trade model with two commodities, two countries and labour as the sole factor of production is Haberler's invention – not Ricardo's (Gehrke, 2015).

Unlike the textbook trade model, Ricardo does not assume perfect international factor immobility. He merely refers to the 'difficulty with which capital moves from one country to another, to seek a more profitable employment, and the activity with which it invariably passes from one province to another in the same country' (Vol. I, pp. 135-136). The assumption that capital is less mobile across country borders than within these borders seems to be quite reasonable even nowadays.

Moreover, Ricardo's current critics often forget to mention that he explicitly referred to the expected consequences of a greater international factor mobility when he stated:

'It would undoubtedly be advantageous to the capitalists of England, and to the consumers in both countries, that under such circumstances, the wine and the cloth should both be made in Portugal, and therefore that the capital and labour of England employed in making cloth, should be removed to Portugal for that purpose. In that case, the relative value of these commodities would be regulated by the same principle, as if one were the produce of Yorkshire, and the other of London: and in every other case, if capital freely flowed towards those countries where it could be most profitably employed, there could be no difference in the rate of profit, and no other difference in the real or labour price of commodities, than the additional quantity of labour required to convey them to the various markets where they were to be sold' (Vol. I, p. 136).

Ricardo believed, thus, that if one day capital and workers could move as easily between countries as within political borders, the relative value of commodities produced in different countries would be regulated by the same principle as if they were produced in the same country, namely by the amount of labour time required for their production and conveyance.

## 6. Main Advantages of Ricardo's Numerical Example over the Textbook Trade Model

Taking into consideration all the crucial aspects in which the typical textbook trade model departs from the original numerical example in the *Principles*, one must conclude that the former is neither an accurate reproduction nor a rational reconstruction of the latter. Instead, the textbook trade model should be viewed as a genuine neoclassical trade model which offers an alternative way of proving the proposition that a country might import some amount of a commodity even though it could produce it internally with less quantity of labour than the exporting country.

Which of the two alternative methods for proving this proposition should be given preference, then? Ricardo's numerical example has several advantages over the neoclassical textbook trade model. It offers, for example, a simpler way of calculating the gains from trade. Moreover, it does not rely on any of the unrealistic assumptions that have been so harshly criticised in the literature. As a response to this critique, various scholars have invested a considerable amount of time and effort in trying to relax some of these assumptions. It seems to me, though, that these efforts amount to a misallocation of valuable intellectual resources, since one can easily avoid relying on any of the criticised assumptions by simply using Ricardo's proof of comparative advantage.

Moreover, the textbook trade model explains the commodity composition of international trade by persistent differences in labour productivity among countries. This is indicated in the trade model by the fact that labour-time requirements per unit usually differ among countries and are assumed to remain constant. Differences in labour productivity presumably result from employing different production technologies, and are thus exogenously given.

The model's assumption of persistent technological differences among countries is problematic, to say the least. It implies either that there are socioeconomic and cultural barriers that preclude the inhabitants of developing countries from copying, assimilating or even improving the productive techniques invented in the advanced countries, or that the latter can effectively prevent the erosion of their technological advantages. Both explanations for the persistency of technological differences among countries may seem more or less plausible in the short term, but they are not particularly convincing in the long term. There are plenty of historical examples where a less developed country initially copies and later improves the production technologies of advanced countries. Japan and South Korea are two well-known examples of this catching-up process in recent economic history. China seems to be a sure bet for a similar development in the coming decades.

Moreover, a trade model which explains international exchanges only by referring to persistent technological differences, has an important limitation: it is unable to explain exchanges between economies with similar levels of economic development. This important limitation of the textbook trade model is another blatant departure from Ricardo's theory of international trade. Following his intellectual mentor Adam Smith, Ricardo explicitly mentions in the *Principles* several sources for having a relative facility in the production of certain commodities. Like Smith, Ricardo also believed in the inherent benefits of specialisation and the division of labour. Their common approach explains the benefits of trade between countries irrespective of their relative level of economic development.<sup>39</sup>

Finally, Ricardo's numerical example is also superior to the neoclassical textbook trade model in terms of empirical validity. As already stated, the latter predicts that countries will specialise in different economic activities based on their relative productivity differences. In case of complete specialisation, though, proving this prediction empirically imposes a key

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<sup>39</sup> See Morales Meoqui (2014).



challenge, since the imported commodities will not be produced in the importing country. Consequently, in most cases the key explanatory variable of this trade model – differences in labour requirements – cannot be directly observed.<sup>40</sup>

In comparison, it does not require a lot of empirical research to realise that the propositions Ricardo announced and fully proved in the famous numerical example remain as valid today as they were 200 years ago. It is an easily observable fact that in current international exchanges the relative value of commodities is not determined by the amount of labour-time required for their production. Goods produced in China with substantial quantities of labour, for example, are exchanged for European or US goods whose production requires less amount of labour-time. Contrary to the postulates of the labour theory of value, the Chinese goods are generally cheaper and have a lower relative value than the ones from Europe and the US. The latter countries import inexpensive goods from China, although they could produce them internally with less quantity of labour. Thus, Ricardo's propositions can only be considered as obsolete by those who ignore economic reality or do not understand what he intended to prove in the numerical example. While it is unquestionable that nowadays capital crosses country borders more expeditiously than during Ricardo's lifetime, the same cannot be said about labour. It seems that both capital and labour have to be internationally mobile for the labour theory of value to determine the exchange value of commodities.

## **7. Conclusions and Recommendations**

This paper is meant as a sort of amicus brief in favour of Ricardo amid the current wave of criticism in the economic literature towards the textbook trade model of comparative advantage. An unprejudiced reading of the famous numerical example in the *Principles* absolves him from this critique.

The current formulation of the textbook trade model has been the result of two important misinterpretations of Ricardo's original proof of comparative advantage. The first misinterpretation consists in the definition of the four numbers as the quantities of labour required to produce a single unit of cloth and wine in England and Portugal, while the second misinterpretation concerns the alleged reliance of Ricardo's proof of comparative advantage on the labour theory of value. These two misinterpretations led to significant breakpoints between the numerical example in the *Principles* and the textbook trade model. Besides the differences in terms of assumptions and implications, the textbook trade model proposes an alternative rule to the one used by Ricardo for determining the beneficial nature of an exchange. As has been shown here, in some cases the textbook rule may suggest that the exchange is beneficial for a country, while Ricardo's rule may suggest the opposite. In this sense one can affirm that numerical example in the *Principles* and textbook trade model convey diverging notions of comparative advantage.

Taking all these differences into account, it seems clear now that the textbook trade model can no longer be considered as an accurate reproduction or rational reconstruction of Ricardo's numerical example. It is, in fact, quite difficult if not impossible to grasp the original purpose of the numerical example in the *Principles* by looking at it through the lenses of the textbook trade model. To truly understand Ricardo's numerical example, one should read the primary source without prejudice.

Furthermore, the ongoing and widespread custom in the economic literature of referring to the neoclassical model of international trade based on opportunity costs as 'Ricardian trade model', cannot be sustained. This blatant misnomer seems to me as absurd

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<sup>40</sup> See Deardorff (1984) and Costinot and Donaldson (2012).

as naming an Earth-centred model of the universe after Nicolas Copernicus or Galileo Galilei. Moreover, it is utterly misleading because it suggests a high degree of continuity and compatibility between Ricardo's trade theory and the textbook trade model, when in fact they have very little, if anything, in common. To avoid further misunderstandings and facilitate a clear distinction between the two alternative notions of comparative advantage in the future, it is necessary to find a new denomination for the textbook trade model. It might be called, for example, the Constant Unit Labour Costs model (CULC), to highlight the two most distinguishing attributes of the model's numbers. If one prefers to name it after an economist instead of this catchy acronym, it would be certainly more accurate to refer to it as Haberler's trade model, since he was the one who originally proposed the reformulation of comparative advantage in terms of opportunity costs.

Ricardo's numerical example and Haberler's trade model constitute two alternative methods for proving the same proposition, namely that a country might import some quantity of a commodity even though it could produce it internally with less quantity of labour than the exporting country. Ricardo's proof of this proposition, though, is clearly superior in terms of elegance and simplicity. Moreover, it has the additional advantage that it does not rely on any of the unrealistic assumptions associated with Haberler's trade model, like constant unit labour time requirements, zero transportations costs, full-employment and perfect internal mobility of the factors of production. These assumptions limit considerably the validity of Haberler's trade model. Ricardo's two interlinked propositions, on the other hand, remain as valid today as they were 200 years ago.

Finally, I support the critics' claim that Haberler's trade model should be removed from the central position it currently occupies within international trade theory. The expected effect of this removal on the current political and academic debate about free trade and globalisation, though, would be quite different from that which the critics are hoping for. The current reliance of the mainstream case for free trade on a theoretic trade model with utterly unrealistic assumptions has given the opponents of free trade an easy target to rally against. Consequently, its eventual removal would rather strengthen the case for free trade, bringing it more in line with the one originally formulated by Smith, Ricardo and other representatives of the classical school of economic thought.

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Morales Meoqui, J. (2017) 'Ricardo's Numerical Example Versus Ricardian Trade Model: A Comparison of Two Distinct Notions of Comparative Advantage.' *Economic Thought*, 6(1), pp. 35-55.  
<http://www.worldeconomicsassociation.org/files/journals/economicthought/WEA-ET-6-1-MoralesMeoqui.pdf>