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Constructing a Myth that Ricardo Was the Father of the Ricardian Model of International Trade: A Reconsideration of Torrens' Principles of Comparative Advantage and Gain-from-trade

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Constructing a Myth that Ricardo Was the Father of the Ricardian Model of International Trade: A Reconsideration of Torrens' Principles of Comparative Advantage and Gain-from-trade[†]

Taro Hisamatsu

Abstract

Historians of economic thought have often pointed out that Ricardo's famous England-Portugal model differs from the "Ricardian model" presented in modern international economics textbooks. This paper argues that the erroneous belief that David Ricardo was the father of the Ricardian model might have arisen from Robert Torrens' own explanations of comparative advantage and his repeated claims. The principle of comparative advantage put forward by Torrens has much in common with the modern Ricardian model. In the early twentieth century, distinguished writers of international trade theory devoted their attention to a great controversy among famous economists in the authoritative *The Economic Journal* about who should be considered the true father of comparative advantage, Ricardo or Torrens, and concluded that Ricardo, in his text, proposed the same principles of comparative advantage as Torrens had presented.

1. Introduction

An enduring controversy in the century-long history of economic thought is who discovered the principle of comparative advantage. Edwin Seligman (1903), who in 1903 was president of the American Economic Association, first stressed that Robert Torrens (1780?-1864) in 1815 anticipated David Ricardo's 1817 principle of comparative advantage.[1] The claim was resolutely opposed by Jacob Hollander (1910) who held the view that it was Ricardo's discovery. A controversy ensued in *The Economic Journal*, one of the most authoritative publications in the field of economics (Seligman and Hollander 1911). Seligman's claim gained the support of later distinguished economists, such Gottfried Haberler (1933), Jacob Viner (1937), Joseph Schumpeter (1954), Lionel Robbins (1958), John Chipman (1965), Paul Samuelson (1969), Douglas Irwin (1996), Marry Kemp, and Masayuki Okawa (2006), not to mention Roy Ruffin (2002; 2005), who insisted on "debunking a myth" of Torrens' 1815 anticipation and declared Ricardo's 1816 discovery. Ruffin was overwhelmingly in favor of the view that what Torrens described in 1815 was the concept of absolute advantage.[2]

"The myth," Ruffin (2005, 711) wrote, "was started by Torrens himself in 1826 [in the third edition of *External Corn Trade*] and was given a boost when John Stuart Mill (…) reported Torrens's claim in a footnote" of the chapter on international trade, in the 1862 edition of the *Principles of Political Economy*. However, Torrens' 1826 and 1857 claims, the latter of which was reported by J. S. Mill, give rise to some questions that should be reconsidered.

Giancarlo de Vivo (2010) argues that there is "a fuller statement" of the principle of comparative advantage "than the rather cursory one we find in Torrens's 1815 *External Corn Trade*" in a pamphlet entitled *Considerations on the Importation of Foreign Corn* published anonymously in 1814. In the preface to the first edition of *External Corn Trade*, Torrens (1815, xiv) did acknowledge that he had read the pamphlet. Therefore, it has been pointed out that Torrens "might have borrowed" the principle from it (Grančay and Grančay 2015, 71). However, there is no reference to the pamphlet in the preface to the 1826 edition of Torrens' *External Corn Trade*. Is it true then that Torrens might have borrowed the comparative advantage arguments from the pamphlet?

One must also wonder why, despite having read all the editions of Ricardo's *Principles* (1817-23), Torrens did not claim priority until 1826.

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[1] More correctly, Leser (1881) first mentioned Torrens' 1815 discovery, but his "comment attracted no notice" (Viner 1937, 441-2).

[2] For details of the debate, see Grančay and Grančay (2015, 70-1). See also Aldrich (2004).

Furthermore, Torrens implicitly recanted his previous claims between April 22 and November 17, 1843, and in 1852 accepted Ricardo's contributions to the theories of international trade (Torrens 1843a; 1843b; 1852, 17). Why did Torrens re-claim his priority in 1857?

On the other hand, one should note the following concerning Ricardo's trade model of comparative advantage. Yukizawa ([1974] 1988), Ruffin (2002), and Maneschi (2004), following Sraffa's (1930) interpretation, were the first seriously to point out that Ricardo's famous England-Portugal model differed from the "Ricardian model" presented in modern international economics textbooks. It is also argued that Ricardo shed light on the savings of labor rather than on the amount of use value in considering gains from trade (Tabuchi 2006), and that his model only explains the extension of what Viner (1937, 440) called the "eighteenth-century rule" (Faccarello 2015b, 758; Gehrke 2015, 811). Faccarello (2015b), furthermore, argues that Ricardo did not always state the international immobility of capital and labor; that, for him, there were no significant differences between domestic and international trade, and that his discussion of comparative advantage was not a "principle." Some historians of economic thought have said that the explanations given by James Mill and/or his son led modern economists to believe that Ricardo was the father of the modern Ricardian model (Yukizawa [1974] 1988, 124; Tabuchi 2006, Chapter 4). However, one cannot ignore the possibility that this erroneous interpretation might have arisen from Torrens' own explanations of comparative advantage and his repeated claims.

This paper examines Torrens' 1826 and 1857 claims, considering how he was involved in the dissemination of an erroneous interpretation that Ricardo was the father of the Ricardian model. Section 2 discusses how Ricardo's England-Portugal model, as well as James Mill's gain-from-trade theory, was viewed. Section 3 considers Torrens' 1826 claim, his 1815 discussion, and his 1827 principle with respect to comparative advantage. Section 4 indicates that he might not have borrowed the comparative advantage arguments from the1814 anonymous pamphlet and argues that, in early 1826, he could have learned of the principle from James Pennington's criticism of James Mill's early theory of gain-from-trade and James Mill's correction thereof in the third edition of the *Elements of Political Economy*. Torrens' 1843 revocation of his previous claim and his new claim in 1857 are dealt with in Section 5, which also examines his early theory of gain from trade. We show that he himself never tried to claim priority of his discovery of comparative advantage; it was posterity that misunderstood Mill's footnote to the explanation of *comparative advantage*. Section 6 concludes the paper.

2. The Principle of Comparative Advantage: Ricardo and Later Developments

2.1 The Ricardian model of international trade

It is well known that Ricardo, in the chapter on foreign trade of his *Principles*, presented the famous "four magic numbers" (Samuelson 1969, 4) of 80, 90, 100, and 120. Many textbooks of international economics interpret these numbers as constant input coefficients of labor and, following this interpretation, proceed to explain the modern "Ricardian model" of international trade. The basic assumptions in these textbooks are as follows:

The world consists of two countries of almost the same economic scale, England (H) and Portugal (F), and two kind of goods, cloth (X) and wine (M), which are produced using a single factor, labor. Labor can move freely between industries in the home country—so that the labor force is fully employed in the domestic market—but not between nations. Trade requires no cost of carriage of goods. Each good is produced by the technology of constant returns to scale and thus the four numbers refer to input coefficients of labor for the production of one unit of good i $(i = X, M)$ in country j $(j = H, F)$: a_i^j (> 0). Both countries have an identical utility function (indifference curve) with homothetic preference, which means the gains from trade are directly expressed by the amount of utility (use value).[3]

[3] Denoting the outputs of cloth and wine by $y_X \in \mathbb{R}_+$ and $y_M \in \mathbb{R}_+$, respectively, we may, for example, consider the use value function which is shown as the real-value function of these two variable $(u: \mathbb{R}_+^2 \to \mathbb{R}_+)$: $u(y_X, y_M)$ with strong monotonicity: for any sets of outputs, (y_X, y_M) and $(\tilde{y}_X, \tilde{y}_M)$,

England has a comparative advantage in producing cloth, while Portugal has a comparative advantage in wine, as Table 1 shows.

Table 1 Ricardo's four numbers based on the traditional interpretation

	England (Country H)	Portugal (Country F)
Cloth (Good X)	$a_X^H = 100$	$a_X^F = 90$
Wine (Good M)	$a_M^H = 120$	$a_M^F = 80$

In this case, if the terms of trade lie in the range $a_X^H/a_M^H < p_X^*/p_M^* < a_X^F/a_M^F$, both countries completely specialize in the production of the good in which each has a comparative advantage and from which both can enjoy a greater amount of utility.

However, Ricardo's own economic system is as follows. First, the production of agricultural goods exhibits diminishing returns. In his chapter on foreign trade, he illustrates his England-Portugal model by replacing the production of wine with the phrase "the cultivation of vines" or "growing vines" (135, 137); that is, wine was assumed to be an agricultural good (grape). He clearly endeavored to explain his theory of international trade to consider the benefits of free importation of corn, the production of which involved diminishing returns. Assuming "that there are diminishing returns to labor in the production of at least one good (…) yields the economy's concave transformation curve" (Maneschi 2004, 438) so that trade would not generate complete but incomplete specialization. In fact, Ricardo himself said: "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 neighbors, may, in return for such commodities, import a portion of the corn required for its consumption, even if its lands were more fertile, and corn could be grown with less labour than in the country from which it was imported" (1817, 160; see Gehrke 2015, 809).

Furthermore, in Ricardo's England-Portugal model, England's pattern of specialization is determined independently of Portuguese production conditions, while Portugal's pattern is fixed independently of England's circumstance (Ricardo 1817, 158-9; see Chipman 1965, 479-80).

These points were resolved by Sraffa's (1930) interpretation of Ricardo's four numbers, based on which Yukizawa ([1974] 1988), Ruffin (2002), and Maneschi (2004) proposed a new interpretation of Ricardo's two-county, two-good model.

2.2 New interpretation of Ricardo's four magic numbers

Assume cloth is produced with constant returns to labor while wine is produced with diminishing returns. Denoting the outputs of cloth and wine in country j by y_X^j and y_M^j, respectively, and the labor force employed in producing them by L_X^j and L_M^j, respectively, let their production functions be given as $y_X^j = f_j(L_X^j)$ with $f_j'(L_X^j) > 0$ and $f_j''(L_X^j) = 0$, and $y_M^j = g_j(L_M^j)$ with $g_j'(L_M^j) > 0$ and $g_j''(L_M^j) < 0$, respectively. In addition, let L^j be the labor endowment in country j, that is, it is the country's fully employed labor force; the production possibility set and frontier (transformation curve) are given as $\{(y_X^j, y_M^j) | f_j^{-1}(y_X^j) + g_j^{-1}(y_M^j) \leq L^j, y_X^j \geq 0, y_M^j \geq 0\}$, and $L^j = f_j^{-1}(y_X^j) + g_j^{-1}(y_M^j)$, respectively. From $f_j''(L_X^j) = 0$ and $g_j''(L_M^j) < 0$, we can derive a concave transformation curve.

Let y_X^* (> 0) be given as units of cloth that is traded for y_M^* (> 0) units of wine; that is, the terms of trade are $p_X^*/p_M^* = y_M^*/y_X^*$. Ricardo's four numbers, based on Sraffa's interpretation, are as shown in Table 2.

Table 2 Ricardo's four numbers based on the new interpretation

	England (Country H)	Portugal (Country F)
Cloth (Good X)	$f_H^{-1}(y_X^*) = 100$	$f_F^{-1}(y_X^*) = 90$
Wine (Good M)	$g_H^{-1}(y_M^*) = 120$	$g_F^{-1}(y_M^*) = 80$
Gains from trade	$g_H^{-1}(y_M^*) - f_H^{-1}(y_X^*) = 20$	$f_F^{-1}(y_X^*) - g_F^{-1}(y_M^*) = 10$

England gives y_X^* units of cloth, produced using 100 units of labor, for y_M^* units of wine, the domestic production of which would require 120 units of labor.

$u(\tilde{y}_X, \tilde{y}_M) > u(y_X, y_M)$ if $\tilde{y}_X \geq y_X$ and $\tilde{y}_M > y_M$, or $\tilde{y}_X > y_X$ and $\tilde{y}_M \geq y_M$.

Trade enables England to save 20 units of her labor and the country has an opportunity to enjoy a greater use value. Ricardo stated: "England may be so circumstanced that to produce the cloth may require the labour of 100 men for one year; and if she attempted to make the wine, it might require the labour of 120 men for the same time. England would *therefore* find it [in] her interest to import wine, and to purchase it by the exportation of cloth (Ricardo 1951-73, I, 135; Emphasis added)." Portugal gives y_M^* units of wine, produced using 80 units of labor, for y_X^* units of cloth, the home production of which would require 90 units of labor costs. Trade enables Portugal to save 10 units of her labor and the country has an opportunity to enjoy a greater use value. Ricardo went on to state: "To produce the wine in Portugal might require only the labour of 80 men for one year, and to produce the cloth in the same country, might require the labour of 90 men for the same time. It would *therefore* be advantageous for her to export wine in exchange for cloth (135; Emphasis added)."

J. S. Mill (1844, 5-7) later argued:

> Mr. Ricardo, while intending to go no further into the question of the advantage of foreign trade than to show what it consisted of, and under what circumstance it arose, unguardedly expressed himself as if each of the two countries making the exchange separately gained the whole of the difference between the comparative costs of the two commodities in one country and in the other. (…) This, which was not an error but a mere oversight of Mr. Ricardo, arising from his having left the question of the division of the advantage entirely unnoticed, was first corrected in the third edition of Mr. Mill's *Elements of Political Economy*.

2.3 James Mill and the Gain-from-Trade Theory

In the first and second editions, James Mill proposed numerical examples, in which *constant* returns in producing corn as well as cloth were assumed (1821, 86-7; 1824, 116-7).[4]

England gives y_X^* units of wine, which is produced by 150 units of labor, for y_M^* units of corn, the domestic production of which would require 200 units of labor. Trade enables England to save 50 units of her labor and the country can enjoy a greater use value. Portugal, however, gives y_M^* units of cloth, which is produced by 100 units of labor, for y_X^* units of cloth, the product of which would require the same labor costs. Thus, Poland can save no unit of labor and thus cannot enjoy a greater use value (Table 3).

Table 3 Mill's four numbers: Case of attributing all the gains to England

	England (Country H)	Poland (Country F)
Cloth (Good X)	$a_X^H y_X^* = 150$	$a_X^F y_X^* = 100$
Corn (Good M)	$a_M^H y_M^* = 200$	$a_M^F y_M^* = 100$
Gains from trade	$a_M^H y_M^* - a_X^H y_X^* = 50$	$a_X^F y_X^* - a_M^F y_M^* = 0$

In the same manner, Mill illustrated the case in which trade enables Poland to save units of labor ($a_X^F y_X^* - a_M^F y_M^* > 0$) and to enjoy a greater use value, while England saves no units of labor ($a_M^H y_M^* - a_X^H y_X^* = 0$) and thus cannot enjoy a greater use value.

Mill, in the earlier editions of *Elements*, demonstrated that the gains would accrue entirely to only one country. The lack of gains from trade, however, would not induce the countries to exchange their goods with each other. Mill, in the third edition, "corrected an error of the former editions" (Mill 1826, iv), following criticisms from his son, William Ellis (1800-81), and George John Graham (1801-88), who were members of the study group at George Grote's house (Mill 1873, 121-2). Mill (1826, 122) added to the illustration, the sentence, "The result of competition would be to divide the advantage equally between them." This was "not merely [a] verbal" (iv) alternation, since it implied the range of terms of trade, $a_X^H/a_M^H < p_X^*/p_M^* < a_X^F/a_M^F$.[5]

[4] The explanation follows Tabuchi (2006, 97-102).

[5] From $a_M^H y_M^* - a_X^H y_X^* > 0$, $a_X^F y_X^* - a_M^F y_M^* = 0$, and $p_X^*/p_M^* = y_M^*/y_X^*$, the condition of attributing all the gain to England can be shown as $a_X^H/a_M^H < p_X^*/p_M^* = a_X^F/a_M^F$. On the other hand, from $a_M^H y_M^* - a_X^H y_X^* = 0$, $a_X^F y_X^* - a_M^F y_M^* > 0$ and $p_X^*/p_M^* = y_M^*/y_X^*$, the condition of attributing all the gain to Portugal can be shown as $a_X^H/a_M^H = p_X^*/p_M^* < a_X^F/a_M^F$. Thus, the condition that both of them can enjoy the gains can be shown as $a_X^H/a_M^H < p_X^*/p_M^* < a_X^F/a_M^F$.

J. S. Mill (1844, 5) believed that both his father and Ricardo did not "inquire, in what proportion the increase of produce, arising from the saving of labour, is divided between the two countries." He explained the determination of the terms of trade in his later essay on international trade. In so doing, J. S. Mill (1844, 6-7) borrowed from his father's four numbers presented in the second edition of *Elements* (Mill 1824, 118-9), which are easily convertible to units of labor for one unit of each good in each country. Consequently, historians of economic thought believe that J. S. Mill's explanation could have led twentieth-century writers of international economics to misinterpret Ricardo's "four magic numbers" as input coefficients of labor. However, one cannot ignore the possibility that the erroneous interpretation might have spread from Torrens' own explanations of comparative advantage and his repeated claims.

3. Torrens' Principle of Comparative Advantage

3.1 The 1826 claim

In the preface to the third edition of *External Corn Trade*, Torrens claims that in "the earlier edition," he "first" showed the principle "that commodities, the cost of producing which is greater in foreign countries than at home, may, nevertheless, be imported, provided the comparative disadvantage of the foreign capitalist in producing the imported article be less than the comparative advantage of the domestic capitalist in producing the articles exported in exchange," which was "adopted" by Ricardo and forms "the ground-work" of the chapter on foreign trade of "his very valuable work upon Political Economy and Taxation" (Torrens 1826, vii). Faccarello (2015a, 72) says: "It was Torrens who (…) started to clearly designate the doctrine [of comparative advantage] with the phrases 'comparative advantage' or 'disadvantage'"; however, Torrens' own usage is decidedly ambiguous.[6]

Denoting the cost of producing one unit of good i in country j by a_i^j (>0), what he intended to state may be as follows: even though $a_M^F > a_M^H$, Home (H) "may" import good M from Foreign (F) (and export good X to F) if $a_M^F/a_M^H < a_X^F/a_X^H$, where the left side represents what Torrens said was "the comparative disadvantage of the foreign capitalist in producing the imported article" and the right side "the comparative advantage of the domestic capitalist in producing the articles exported in exchange."[7] Despite Torrens' ambiguous language and the absence of a reference to the existence of the terms of trade between a_X^H/a_M^H and a_X^F/a_M^F, he did, following the idea of comparative advantage, mention a doctrine regulating the pattern of specialization and *unlike Ricardo*, regarded it as a "principle."

3.2 The 1815 discussion of comparative advantage

Torrens, Ruffin (2005, 717) points out, frequently referred to the trade theories of absolute advantage in the first edition. For example, Torrens (1815, 297), in Chapter 2 of Part III argued: "When any given portion of capital can, in England, fabricate a greater quantity of cloth than in Poland; and can, in Poland, produce a greater supply of corn than in England; then, the absence of regulation is all that is necessary to establishing between the countries an active and mutually beneficial commerce." Denoting the input coefficient of capital employed in producing one unit of good i in country j by b_i^j (>0) and "any given portion of capital" commonly employed in any production in both countries by $\overline{K}$ (>0), let the output be given as $\overline{K}/b_i^j$. According to Torrens, the necessary condition to establish reciprocal trade between both countries is that England (H) has an absolute advantage in cloth (X) and Poland (F) has an absolute advantage in corn (M): $\overline{K}/b_X^H > \overline{K}/b_X^F$ and

[6] Nawa (1962, 9-10) points out that Torrens' ambiguity shows his confusing comprehension of the trade theory of comparative production costs.

[7] In common usage, the very inequality $a_M^F/a_M^H < a_X^F/a_X^H$ means that Home has a *comparative advantage* in producing good X and Foreign has a *comparative advantage* in producing good M, or that Home has a *comparative disadvantage* in producing good M and Foreign has a *comparative disadvantage* in producing good X. Therefore, Torrens should have stated that a good, the cost of production of which is greater in Foreign than at Home, may nevertheless be imported, provided the ratio of *absolute* disadvantage of Foreign in producing the imported good ($a_M^F/a_M^H > 1$) is less than the ratio of *absolute* advantage of Home in producing the exported good ($a_X^F/a_X^H > 1$), with both ratios being strictly more than one.

$\overline{K}/b_M^H < \overline{K}/b_M^F$, or $b_X^H < b_X^F$ and $b_M^H > b_M^F$. However, there is the following discussion in the same chapter:

> If England should have acquired such a degree of skill in manufactures, that, with any given portion of her capital, she could prepare a quantity of cloth, for which the Polish cultivator would give a greater quantity of corn than she could, with the same portion of capital, raise from her own soil, then, tracts of her territory, though they should be equal, nay, *even though they should be superior*, to the lands in Poland, will be neglected; and a part of supply of corn will be imported from that country. For, though the capital employed in cultivating at home might bring an excess of *profit* [produce] over the capital employed in cultivating abroad, yet, under the supposition, the capital which should be employed in manufacturing, would obtain a still greater excess of *profit* [produce]; and this greater excess of *profit* [produce] would determine the direction of our industry. (264-5; square brackets in Torrens 1826, 353; emphasis added)

On the basis of the six words, "even though they should be superior," Seligman (1903; 1911), Chipman (1965), and others, regard Torrens as the father of comparative advantage. Torrens here mentioned that even if $b_X^H < b_X^F$ (or $\overline{K}/b_X^H > \overline{K}/b_X^F$) and $b_M^H < b_M^F$ (or $\overline{K}/b_M^H > \overline{K}/b_M^F$), England would import Polish corn instead of engaging in domestic production. Despite the ambiguity, this was based on the idea of comparative advantage.

Ruffin (2005, 716), however, cannot accept that "a handful of words constitutes a theory," and considers Torrens an absolute advantage theorist on the grounds of his many discussions based on absolute advantage in his 1815 text (see also, 715-8). However, his 1826 claim cannot be rejected outright if there were even the slightest discussion on comparative advantage. The important point to consider is whether, in 1815, Torrens could properly understand comparative advantage as a principle or a theory.

Note the replacement of the phrase "excess of profit" with "excess of produce" in 1826. Ruffin does point out: "To an economist, if profit rates are equalized across sectors, as Smith and Ricardo emphasized, comparing profit rates at home with those abroad would have to show that the excess of profit at home over abroad in manufacturing would have to be the same as in corn production under autarky" (717). Therefore, it is incorrect "to explain the pattern of specialization by comparing profit rates at home with those abroad" (716-7). Chipman (1965, 482), who believes Torrens' discovery, even wonders if the 1815 mention of "excess of profit" "distracts considerably from the worth of the statement." Torrens' alternation leads one to believe that, in 1815, he might not have understood comparative advantage as a theory, as Ruffin argues.

3.3 The 1827 Principle of Comparative Advantage

The fourth edition "differs from the third in nothing except in the addition of a new Section [Section 4, Chapter 4, Part III], explaining the "Effects of Free Trade upon the Value of Money" (Advertisement for the Fourth Edition), in which Torrens first properly illustrated the principle of comparative advantage with numerical examples. He demonstrated the proposition: "No difference, however great, in the cost of production universally in one country, and the cost of production universally in another, can occasion an interchange of commodities between them" (Torrens 1827, 401).

Torrens first supposed that, in England (H), "a quarter of corn" (M) and "a bale of cloth" (X) are "each produced at the same cost represented by 10" ($a_X^H = a_M^H = 10$) and that they are "all equal to each other in exchangeable value" in England's market ($a_X^H/a_M^H = p_X^H/p_M^H = 1$); in Poland ($F$), meanwhile, a quarter of corn and a bale of cloth are "each produced at a double cost, represented by 20" ($a_X^F = a_M^F = 20$) and thus are "all equal to each other in value" in Poland's market ($a_X^F/a_M^F = p_X^F/p_M^F = 1$). Then, "[i]n Poland, a quarter of corn is just worth a bale of cloth (…) ; and if this corn were sent to England, where it is also just worth a bale of cloth (…), it would purchase, in the foreign [England's] market, exactly the same quantity of all other commodities which it could have purchased in the home [Poland's] market." That is, there are no gains from trade in both countries on the condition, $a_X^H/a_M^H = p_X^*/p_M^* = a_X^F/a_M^F$. "Though

England produced all commodities for half the cost required to produce them in Poland, yet, between the two countries, no exchange would take place" (401-2).

Torrens next assumed that there was "the difference between the comparative cost of producing commodities in one country, and the comparative cost of producing them in others." "If, in Poland, the cost of producing cloth (…) continued to be twice as great as in England, while the cost of raising corn fell to an equality with the cost of raising it in England" ($a_X^F = 20$, $a_M^F = 10$ and $a_X^H = a_M^H = 10$), "then Polish corn would be exchanged for English cloth and iron."

Table 4 Torrens' 1827 four numbers: Comparative cost theory of production

	England (Country H)	Poland (Country F)
Cloth (Good X)	$c_X^H = 10$	$c_X^F = 20$
Wheat (Good M)	$c_M^H = 10$	$c_M^F = 10$

"Under these circumstances, a quarter of corn, in Poland, would be worth only half a bale of cloth" ($a_X^F/a_M^F = p_X^F/p_M^F = 2$), "while, in England, it would be worth a whole bale" ($a_X^H/a_M^H = p_X^H/p_M^H = 1$). "A Polish merchant, after purchasing a quarter of corn for half a bale of cloth, might send the corn to England, and bring back, in exchange, a whole bale, thus realizing a profit of one hundred per cent., less the expense of carriage." That is, there are no gains from trade in Poland on the condition $a_X^H/a_M^H = p_X^*/p_M^* < a_X^F/a_M^F$. It should be noted, however, that the Polish merchant, on Torrens' supposition, has to pay the sum worth 0.05 bale —10% of his gain of 0.5 bale— as the carriage costs (402-3). On the other hand, considering carriage costs, England's trading would incur a loss, and thus the country has no incentive to trade. The absence of trade must be accompanied by the non-participation of Poland. From Torrens' argument that trade must be always reciprocal, it is not difficult to induce the condition $a_X^H/a_M^H < p_X^*/p_M^* < a_X^F/a_M^F$.

From the above, we see that the existence of gains from trade must depend on "the difference between the comparative cost of producing commodities in one country, and the comparative cost of producing them in others," "the rate of profit," and "the expense of carriage." Torrens pointed out that the terms of trade (p_X^*/p_M^*) are determined by "the proportion which exists between the demand for foreign commodities in the home market, and the demand for domestic commodities in foreign markets" (401). The reference by Torrens was 16 years before the *publication* of J. S. Mill's theory of reciprocal demand.

Note that, in the above examples, it was assumed that there are constant returns on the production of any good. The Torrensian system, like the Ricardian, requires the assumption of diminishing returns in agriculture, but some numerical examples in his writings (Torrens 1819; 1821), *for the sake of simplification*, assumed constant returns even in agricultural production.

4. Torrens' Learning of Comparative Advantage

4.1 Torrens and the Anonymous 1814 Pamphlet

In the preface to the first edition of *External Corn Trade*, Torrens clearly acknowledged "that one or two of the arguments contained in the Second Part,[8] may have been suggested by a pamphlet of considerable merit, entitled 'Observations [Considerations] on the Importation of Foreign Corn', and an excellent article [Mill (1814)] which appeared in the Eclectic Review" (Torrens 1815, xiv). The author of *Considerations to Importation of Foreign Corn* states:

> If one of the countries, equally capable of producing the same thing by means of the same labor and capital, should however be able to direct that labor and capital to more advantageous pursuits, the advantage to that country in so doing must be not less apparent, although it should thereby be obliged to receive from the other country the things which it could otherwise have produced within itself. Supposing England and Germany both capable of producing to the manufacture of cotton cloth, producing a quantity of it greatly beyond what

[8] De Vivo (2010, 101) points out: "The fact that Torrens's acknowledgement refers to Part II of the *External Corn Trade*, whereas his own formulation of the comparative cost principle appears in Part III, is rather irrelevant."

> Germany may be able to produce by the similar application of its labor and capital, then must both countries still be benefited by the exchange. Germany in this case obtaining the cotton cloth at a cheaper rate than that at which, relatively to the iron or wheat, it could have been made for in Germany; yet sufficiently above that of the labor and capital required for its production in England, by means of superior ingenuity, to make the exchange also advantageous to England. Germany obtains more cotton cloth than it could have fabricated for itself, by means of the same labor and capital employed in the production of the corn or iron. England obtains more corn or iron than it could have produced for itself by means of the same labor and capital employed in the fabrication of the cotton cloth. Exchanges of this sort constitute the basis of commerce. (Anon. 1814, 8-9)

Denoting the input coefficient for the production of one unit of good i in country j by a_i^j (>0) and a given labor-cum-capital commonly employed in any production in both countries by $\bar{L}$ (>0), let the output be given as $\bar{L}/a_i^j$. In the example, England (H) has absolute advantage over Germany (F) in producing cotton cloth (X), $\bar{L}/a_X^H > \bar{L}/a_X^F$ or $a_X^H < a_X^F$, while there is indifference advantage in producing iron (M) between both countries, $\bar{L}/a_M^H = \bar{L}/a_M^F$ or $a_M^H = a_M^F$. According to the author, *even in the case* that England and German specialize in the production of cotton cloth and iron, respectively, and exchange their goods, both countries might gain from trade. It is a fact that this explanation, although not necessarily satisfactory, must be based on comparative advantage.

Might Torrens, who hated plagiarism (Torrens 1833, 57-8), have borrowed the principle of comparative advantage presented in the *Considerations*? There is no reference to *Considerations* in the third edition of *External Corn Trade*. His silence implies that, although he read it, at the time he did not notice or understand the principle.[9]

4.2 Torrens and James Mill's 1826 Elements

Torrens, as it is known, was keen to establish his claim for priority of theory and had read all the editions of Ricardo's *Principles*. However, his first claim appeared not in the 1819 but in the 1826 edition of his *External Corn Trade*, that is, nine years after the publication of Ricardo's 1817 text. This explains Torrens' 1815 incomprehension of comparative advantage and shows that he learned of it from Ricardo's text. When and from what did he learn it?

The third edition, the greatly revised version of the former, simply mentioned a comparative advantage theory in the preface, with a small alteration of the phrase from "excess of profit" to "excess of produce" in the sentence in question. We can guess that he grasped the comparative advantage theory before writing the preface of the third edition, dated February 2, 1826. Torrens (1826, xv) was aware of "the last [third] edition" of Mill's *Elements*.

There is his refutation of Mill's new explanation of the relationship between wage and profit rates over three pages in the preface (xiv-xviii). It is plausible that his attention was directed to Mill's correction of gains from trade, too. As Section II pointed out, Mill's correction implicitly meant the presentation of the pattern of specialization, to which Torrens ambiguously referred in the preface.[10]

4.3 Torrens and Pennington's criticism of Mill

However, we cannot reject the hypothesis that Pennington helped Torrens understand the principle of comparative advantage. His criticism of Mill's 1821 error of attributing all the gain to one of two countries was published in the "letter on the Importation of Foreign Corn, and the Value of the Precious Metals in different countries (…) written in the early part of last year [1839]," which is included in the 1840 *Letter to Finlay* (Pennington 1840, Advertisement). However,

[9] Considering that the first edition "was written in 1814" (Torrens 1826, ix), it is difficult to interpret that Torrens understood the discussion of comparative advantage in the anonymous pamphlet that appeared the same year and applied it properly in his forthcoming text.

[10] Torrens had read the first edition of Mill's *Elements* and his review of it appeared in his own newspaper *The Traveller* (Torrens [1822] 1936). His book review shed light on Mill's value but not on his trade.

Torrens had read the unpublished writing long before the publication.[11] In his "Advertisement for the Fourth Edition" dated February 3, 1827, he argued: "While investigating the principles which regulate the value of money when the material of which it is composed is a foreign product, I received much assistance from a very curious and elaborate Critique by Mr. Pennington, upon some doctrines connected with this subject, which had been advanced by Mr. Ricardo and Mr. Mill."

Pennington (1840, 40-3) proposed the comparative advantage theory and a crude version of the theory of reciprocal demand (see Viner 1937, 446). After the publication of the third edition, Torrens, less than a year later, published the fourth edition, which added only one section to the former edition. This section included Torrens' numerical example of comparative advantage and his reference to the terms of trade depending on "the proportion which exists between the demand for foreign commodities in the home market, and the demand for domestic commodities in foreign markets," which was written under the influence of Pennington's ideas. In early 1826, Torrens could learn, whether directly or indirectly, from Mill's text and Pennington's unpublished writing.[12]

5. Torrens' Revocation and His New Claim

5.1 The 1843 Postscript

In his *Postscript to a Letter to Peel*, dated April 22, 1843, Torrens stated: "In a volume upon the Corn Trade, first published in 1815 (…), I propounded the same identical principles regarding international exchange and the distribution of the precious metals, which (…) are involved in Mr. Ricardo's chapter upon Foreign Trade" (Torrens 1843a, 3-4). Rather than being a determinant of the pattern of specialization, this claim, unlike the one in 1826, pertains to the principle "that productive cost is the regulator of exchangeable value as regards the commodities of the same country, and not as regards the commodities of different countries."

He argued:

> It is a law universally admitted that the exchangeable value of all commodities, whether produced in the same country, or in different countries, is determined by the relation of demand to supply. But there is an important difference, as regards the effect of demand and supply upon exchangeable value, between the commodities which are produced in different countries. In the same country, the cost of production adjusts the relation of demand and supply, and, consequently, becomes the ultimate regulator of exchangeable value with respect to all those domestic commodities which are not subject to monopoly; while, as regards different countries, cost of production has a slight, and frequently an imperceptible influence in adjusting supply to demand; consequently, cannot be regarded as the ultimate principle which regulates the terms of international exchanges. (4-5)

As to the reason the terms of international trade cannot be regulated by the production cost theory, Torrens said:

> When commodities produced, at equal cost, in the same vicinity, are brought to market in such proportions as to render them of unequal value in exchange, then labour and capital can be transferred without much difficulty from the production of the least valuable, to the production of the most valuable articles, until, from the diminishing supply of the former, and the increasing supply of the latter, their exchangeable value becomes proportionate to

[11] Gehrke (2015, 21) believes Pennington's writing "might have been already in 1825."

[12] Torrens later stated: "In the view of the question presented by Mr. Ricardo, the advantages derived from foreign Trade were confined to only one of these countries. Mr. Ricardo's error was corrected by Mr. Pennington; and the correction, if I rightly remember, was adopted by Mr. James Mill in the third edition of his Principles [Elements] of Political Economy" (Torrens 1857, xvi). De Vivo (2000a, xxii) points out: "As Sraffa has shown, Torrens got it completely wrong. Ricardo never made such a mistake ["that the advantage would be entirely reaped by only one country" (xxi)]; a mistake was made by Mill in the first edition of his *Elements* (1821), and corrected in the third (1826), following criticisms from his son and his study group [Ellis and Graham]; Pennington's correction came when Mill had already corrected his mistake." See also Sraffa (1930, 543) and Viner (1937, 445-6).

> their productive cost. As regards different countries, this equalizing transference of labour and capital is always difficult, and frequently impracticable. (5)

Torrens also states, in his England-Cuba model, that "the difference of language, of religion, and of climate, would interpose an insuperable obstacle to such a transference of labour from England to Cuba, as would cause the international exchange of commodities to be ultimately determined by productive cost" (5-6). According to him, the immobility of the factors is attributed not only to the geographical matter of the distance between nations, but also to the distinctive characteristics of the factors, or the so-called "specific factors."

Hence, Torrens argued that the terms of international trade depended on "the reciprocal relations of demand and supply" (6) on the ground of the immobility of capital and labor between nations. The determination of the terms was, according to him, "regarded as forming the most important branch of economical science," (4) which then was his object of interest.

5.2 The 1843 Letter to Senior

J. S. Mill's *System of Logic* appeared in 1843, the year Torrens wrote the *Postscript*. The following year, the *Budget* was published with "*An Introduction, in which the Deductive Method, as Presented in Mr. Mill's System of Logic, is Applied to the Solution of Some Controverted Questions in Political Economy*." In it, Torrens (1844, xxi) atoned for his poor behavior toward his "great master" Ricardo. He acknowledged, "I indulged the self-delusion, that while employing Ricardo's indestructible machine in manufacturing a wider fabric than the pattern he presented, I was creating the instrument I borrowed" (xvi).

In his *Letter to Senior*, dated November 17, later included in the 1844 *Budget*, Torrens recanted his previous claim. The "principles of international exchange which I [Torrens] had borrowed from Ricardo" (1843b, 4) indicate the following: "the principle propounded by Ricardo, that cost of production, while it regulates the value, in relation to each other, of commodities produced in the same country, does not regulate the value, in relation to each other, of commodities produced in different countries," from which Torrens "deduced" the conclusions regarding international trade (14), and "the doctrine regarding the distribution of the precious metals propounded by Ricardo" (8), or more specifically, "the doctrine regarding the local value of money, established by Ricardo, illustrated by [James] Mill, and borrowed by myself [Torrens]" (7).

Torrens' *Letter* was his reply to the criticism of Senior's 1843 *Edinburgh Review* article (Senior 1843). "In entering upon a conflict in defence of the discoveries of Ricardo," Torrens (1843b, 14) adopted "the precaution of placing Ricardo himself in the front of the battle" against Senior, favorably citing Ricardo's chapter on foreign trade (see De Vivo 2000b, xxii). The critical points were as follows:

> I maintain, that the terms of international exchange are regulated not by cost of production, but by demand and supply; you maintain that they are regulated not by demand and supply, but by cost of production. My position is that the relative value of foreign commodities is regulated by a different rule from that which regulates the relative value of domestic commodities; your position is that the relative value of domestic commodities, are regulated by one and the same rule. (Torrens 1843b, 14)

Torrens was at that time interested in the terms of trade question rather than in the determinant of the pattern of specialization. J. S. Mill published the essay, clearly putting forward the theory of international exchangeable value by means of the concept of what we now call "offer curve."

> [T]he controversies excited by Colonel Torrens' *Budget* have again called the attention of political economists to the discussions of the abstract science (…) and (…) the first paper relates expressly to the point upon which the question at issue between Colonel Torrens and his antagonists has principally turned.[13] From that paper it will be seen that

[13] Mill already had an interest in the question. In the meeting on

> opinions identical in principle with those promulgated by Colonel Torrens (there would probably be considerable difference as to the extent of their practical application) have been held by the writer for more than fifteen years: although he cannot claim to himself the original conception, but only the elaboration, of the fundamental doctrine of the Essay. (Mill 1844, iii)

In the meeting of the Political Economy Club held on December 5, 1844, members discussed the question, "Was Ricardo correct in stating that 'the same rule which regulates the relative cost of Commodities in one country, does not regulate the relative value of the Commodities exchanged between two or more countries?'" (Political Economy Club of London 1921, 57). This was Torrens' question; however, owing to his absence, Mill presented it instead (291). This shows they shared their interest in the terms-of-trade subject.[14]

5.3 The re-publication of The Economists Refuted

In the later tracts on *Finance and Trade*, Torrens (1852, 17) again referred to "Mr. Ricardo's great work on Political Economy and Taxation," restating "that profound and original writer propounded, for the first time, the true theory of international exchange" in "his chapter upon foreign trade."[15]

On the other hand, Torrens (1857, xv-xvi), in re-publishing his early pamphlet entitled *The Economists Refuted*, made a new claim:

> I (…) explained, I believe, for the first time, the nature and extent of the advantages derived from trade. The principles which I propounded in 'The Economists Refuted,' Mr. Ricardo subsequently adopted in his great work on Political Economy and Taxation; and as my previous publication has been long out of print and forgotten, it was generally believed that it was reserved for Mr. Ricardo (…) to show that the benefit resulting from foreign trade consists of the increased production created by international divisions of employment. I had shown that the increased production thus created was divided, in variable proportions, between the countries exchanging their respective productions.

Consistent with Smith, Torrens ([1808] 1993) had stated that the "*expectation* of being able to exchange the articles which they do not want, for other articles that they stand in need of, induces men to divide their labour" and thus to "augment, to an astonishing degree, the productiveness of industry (31)." He argued that "as it is the home trade that gives rise to the home divisions of labour, so it is [that] foreign trade or commerce that gives rise to foreign divisions of labour (31-2)," and thus "commerce, by establishing divisions of labour between the individuals of different nations, is a means of augmenting wealth (34)."[16] As Yoshinobu (1991, 36) points out, when Torrens thus mentioned that the gains consist of the increased production created by international divisions of labor, he had in mind the augmented amount of enjoyable use value. With the England-France example, Torrens ([1808] 1993, 34-5) had demonstrated that the gains from foreign trade were "always reciprocal."

> When England manufactures a surplus quantity of cloth, and exchanges it with France for wine, she

May 6, 1841, he had proposed the question: "According to what principle is the benefit of the Trade between two nations shared between two nations?" (Political Economy Club of London 1921, 52). Moreover, there was a difference in how Torrens and Mill defined "demand."

[14] However, they did not necessarily share the same theory of the terms of trade, that is, the same theory of reciprocal demand, because they defined "demand" differently. (Political Economy Club of London 1921, 52).

[15] According to Torrens (1852, 17-18), it was Ricardo who first "showed that the relative value of the commodities produced in different countries is not determined, like the relative value of commodities produced in the same country, by the cost of production; that a country possessing peculiar advantages in the production of commodities extensively demanded in other countries obtains, in exchange for the produce of any given quantity of its labour, the produce of a greater quantity of foreign labour." Viner (1937, 444) argues that "Torrens, it is true, apparently has reference here rather to the terms of trade question than to comparative costs, but he had also claimed priority with respect to [the] terms of doctrine."

[16] The term "wealth" was defined by the "articles which supply our wants, and gratify our desires" (Torrens [1808] 1993, 1).

> obtains more wine than she could have obtained by cultivating the grape at home. But, in this transaction, the gain of England is not the loss of France. On the contrary, France has made an accession to her wealth. In exchange for her wine she has acquired a greater quantity of cloth than she could have acquired by converting her vineyards into sheep-walks, and manufacturing wool at home.

"But," he stated, "although the advantages of commerce are reciprocal, yet it does not follow that they should be equal." That is, "When countries exchange their commodities, each may be benefited, but each in a different degree" (35).

Torrens explained the way "to estimate the extent of the benefit which foreign trade confers" (35-6) with a two-country, two-good model. In order "to know the extent of the advantage, which arises to England, from her giving France a hundred pounds worth of broad cloth, in exchange for a hundred pounds worth of lace," we have to "take the quantity of lace which she has acquired by this transaction, and compare it with the quantity which she might, at the same expense of labour and capital, have acquired by manufacturing it at home" (37).[17] That is, using the input coefficient a_i^j (> 0), Torrens' method can be explained as follow.

When England (H) exports $\bar{L}/a_X^H$ units of broadcloth (X) produced with a given $\bar{L}$ (> 0) of its labor and import $\bar{L}/a_M^F$ units of lace produced with the same quantity of labor in France (F), England's gains from this trade can be calculated as $\bar{L}/a_M^F$ units of imported lace (M) minus $\bar{L}/a_M^H$ units of lace that England could produce with the same quantity of labor: $\bar{L}(1/a_M^F - 1/a_M^H) = \bar{L}(a_M^H - a_M^F)/a_M^H a_M^F$.[18] On the other hand, when France exports $\bar{L}/a_M^F$ units of lace produced with a given $\bar{L}$ of its labor and imports $\bar{L}/a_X^H$ units of broadcloth produced with the same quantity of English labor, France's grains can be calculated as $\bar{L}/a_X^H$ units of imported broadcloth minus $\bar{L}/a_X^F$ units of broadcloth that France could produce with the same quantity of labor: $\bar{L}(1/a_X^H - 1/a_X^F) = \bar{L}(a_X^F - a_X^H)/a_X^H a_X^F$. Thus, the gains from trade depend upon the productivity $(1/a_i^j)$ or technical conditions (a_i^j) in both countries. Torrens states: "The only way, therefore, of ascertaining the amount of the benefit derived from commerce, is to ascertain the degree in which the foreign divisions of labour augment the productiveness of human industry (37)."

Trade must confer positive gains for both countries. That is, $\bar{L}(a_M^H - a_M^F)/a_M^H a_M^F > 0$ and $\bar{L}(a_X^F - a_X^H)/a_X^H a_X^F > 0$. In so doing, it must satisfy the condition, $a_M^H > a_M^F$ *and* $a_X^F > a_X^H$, which means that France has an absolute advantage in producing lace *and* England has an absolute advantage in producing broadcloth. However, even if $a_M^F/a_M^H < a_X^F/a_X^H$, the condition, $a_M^H > a_M^F$ and $a_X^F > a_X^H$, is not necessarily realized. Therefore, his 1808 theory of gains from trade holds only under the condition of absolute advantage. Torrens himself recognized the fact and never tried to claim priority of his discovery of comparative advantage. His "object" of the re-publication was "to claim" his "right to be regarded as the original propounder" of the "theory of the nature and the extent of the advantages derived from foreign trade" which he "ventured to present to the public forty-nine years ago" (Torrens 1857, xvi). Unfortunately, his claim should be rejected, because his theory was constituted only by what was already known to eighteenth-century economists; that is, the "eighteenth-century rule." However, this is not a matter of importance. Rather, what is important is that notable economists in the future would confuse the claim to the priority of gain-from-trade theory with that of comparative advantage.

The re-published pamphlet was a supplement to the 1857 edition of *The Principles and Practical Operation of Sir Robert Peel's Act of 1844*, with the article "*A Critical Examination of the Chapter 'On the Regulation of a Convertible Paper Currency' in Mr. J. S. Mill's Principles of Political Economy*." The provocative title tempted Mill to read this book. Mill (1965, 589) footnoted the explanation of *comparative advantage* in the chapter on international trade in the fifth edition of the *Principles of Political Economy* thus:

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[17] As Fujimoto (1994, 77) points out, Torrens here considered English broadcloth and French lace to be the result of the same costs of production (the same sets of labor and capital) and thus they have the same exchangeable value represented by £100.

[18] More exactly, gains were an amount of use value of the added quantity of goods derived from trade: $u^H = u(\bar{L}(a_M^H - a_M^F)/a_M^H a_M^F)$.

> I at one time believed Mr. Ricardo to have been the sole author of the doctrine now universally received by political economists, on the nature and measure of the benefit which a country derives from foreign trade. But Colonel Torrens, by the republication of one of his early writings, "The Economists Refuted," has established at least a joint claim with Mr. Ricardo to the origination of the doctrine, and an exclusive one to its earliest publication.

This footnote to the explanation of *comparative advantage* handed down to posterity the misinterpretation that Torrens' new claim pertained to comparative advantage and not to the gain-from-trade theory. The impact of Mill and his text on nineteenth-century economics possessed sufficient power to trigger debate on who was the true father of comparative advantage: Ricardo or Torrens? This great controversy commenced in the authoritative *The Economic Journal* published under editor Francis Ysidro Edgeworth (1845-1926), who was one of the first economists mathematically to illustrate the determination of the exchange ratio with an offer curve diagram.

6. Concluding Remarks

In Torrens' two-country, two-good model of comparative advantage, (i) the four numbers given are input coefficients of labor employed in the production of one unit of good, (ii) the production factor is assumed to be immobile between nations, (iii) the gains from trade consist of use value (utility) included in the increased production created by the international division of labor, (iv) both countries' reciprocal gains require the condition that there exist the terms of trade in an open interval between both countries' opportunity costs, and (v) the terms of trade can be determined by "the proportion which exists between the demand for foreign commodities in the home market, and the demand for domestic commodities in foreign markets," or by demand and supply. Torrens model differs from Ricardo's famous England-Portugal model, but is similar to the modern Ricardian model.

All Torrens' claims to international trade theories are associated with the issue of priority for enunciating the concept of comparative advantage. As Ruffin points out, J. S. Mill unintentionally gave a boost to the myth of Torrens' discovery of *comparative advantage* by reporting his claim with respect to the gain-from-trade theory. In the authoritative *The Economic Journal* edited by Edgeworth, a great controversy arose over the discovery of the comparative advantage question between two famous twentieth-century economists, Seligman and Hollander. The important point is not the question of who is the true father of comparative advantage. Rather, it is about the attention the debate attracted from distinguished international trade theorists, such as Haberler and Viner, as well as notable twentieth-century economists, such as Schumpeter, Robbins and Samuelson. They believed that Ricardo, in his text, proposed the same principle of comparative advantage as Torrens had presented—namely, the Ricardian model presented in modern international economics textbooks.

There is a myth that the principle of comparative advantage known as the Ricardian Model was Ricardo's handiwork. Torrens was complicit in the dissemination of this erroneous interpretation.

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