Comparative Advantage: Conception, Formulation, and Implications

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The theory of comparative advantage – generally recognized as a central proposition in economics – spawns several implications that are paramount for economic relationships across economies and business firms. The implications are rooted in the history of its development. This paper presents the conception, formulation, and extension of comparative advantage while explicating its implications. The paper also (selectively) cites the empirical literature on the static and dynamic gains from trade as they relate to comparative advantage.

Keywords: productivity, Ricardian Model, comparative advantage

INTRODUCTION

The theory of comparative advantage spawns several implications all of which rest on the proposition that greater efficiency in production – i.e., using fewer resources than a counter-part to produce a good – does not necessarily result in lower costs. Indeed, the theory holds that even the most efficient economy (and by extension, the most efficient business firm or individual) cannot produce everything at a lower cost. Comparative advantage, Paul Krugman (1998, p.561) notes, "is a harder concept than it seems, because like any scientific concept it is actually part of a dense web of linked ideas". Krugman (1998, p. 571) goes on to say that comparative advantage is "truly, madly, deeply difficult. But it is also utterly true, immensely sophisticated – and extremely relevant to the modern world." Paul Samuelson (1995, p. 22) elevates comparative advantage to even a higher level. He notes, "Thousands of important and intelligent men have never been able to grasp the principle of comparative advantage or believe it even after it was explained to them." The present paper attempts to explicate comparative advantage by tracing its evolution – marked by five intellectual developments – since its conception in 1701. The study of this evolution throws much light on the theory of comparative advantage and especially its central implication that all economies regardless of their circumstances can gainfully participate in the world economy.

Although David Ricardo rightfully gets credit for having formulated the theory of comparative advantage in 1817, it was actually conceived in 1701. Moreover, as we shall see, many scholars in the last 200 years have contributed to its development. The significance of comparative advantage – which has grown since 1817 – is evident from two scholarly international conferences as well as an edited book that marked the bicentennial anniversary of the publication of Ricardo's seminal work. In his introductory remarks, Jones (2017, p.101) observed that the "Ricardian model still has an important place in International Trade Theory two centuries after the book's appearance". One might add that the implications of comparative advantage extend beyond international trade. As we will explain below, Ricardo himself applied the concept to business firms and individuals. But the idea was born and formulated in the context

of international trade and solidly remains so. Section 2 describes five intellectual landmarks in the evolution of comparative advantage. Sections 3 shows the veracity of comparative advantage is independent of variables such as the wage and exchange rates. Section 4 presents its key implications and the supporting empirical evidence. Section 5 ends the paper with a final note.

FIVE INTELLECTUAL LANDMARKS

Conception

An anonymous pamphlet published in 1701 contained an insight that prepared the path for the formulation and articulation of comparative advantage. Nearly three centuries later, MacLeod (1983) identified Henry Martyn as the author of the pamphlet. Martyn put forward his argument as a response to the protectionist sentiments and policies in the second half of the seventeenth century in Britain as international trade surged. The mercantilists, alarmed by the rise in imports, succeeded in passing laws in 1699 and 1701 restricting (even prohibiting) the importation of certain products into Britain. In this heightened protectionist climate Martyn offered an insight that exposed the fallacy of protectionism and showed why mercantilist policies inflict economic harm. He (1701, p. 55) presented his most consequential argument as follows.

> If nine cannot produce above three Bushels of Wheat in *England*, if by equal Labour they might procure nine Bushels from another Country, to imploy these in agriculture at home, is to imploy nine to do no more work than might be done as well by three; is to imploy six to do no more work than might be done as well without them; is to imploy six to no profit, which might be imploy'd to procure as many Bushels of Wheat to *England*; is the loss of six Bushels of Wheat; is therefore the loss of so much value. (Italics original)

Viner (1937, p. 440) re-states Martyn's argument as follows: "it pays to import commodities from abroad whenever they can be obtained in exchange for exports at a smaller real cost than their production at home would entail." The term "real cost" in Viner's statement refers to the amount of resources (in this case, labor) employed in the production of a good. Viner called Martyn's insight the "eighteenth century rule". To illustrate the insight, suppose in a country (say, England) the production of a certain quantity of a good (say, wine) requires 120 workers. Further, suppose England has the ability to import the wine in exchange for a certain quantity of another good (say, cloth) whose production requires only 100 workers. Thus by importing (rather than producing) the wine in exchange for the cloth England would save 20 workers who could produce some other (or more units of the same) goods. Martyn's insight generates several important implications. First, contrary to a mercantilist principle, imports are a source of gains from trade. Second, the saving of 20 workers in England is "a free lunch" that Samuelson (1995, p. 22) attributed to "not-previously-obvious geographical specialization". Third, most importantly, the gains from trade entirely depend on the importing country's production condition – that of the exporting country is irrelevant. This last implication brings us close to comparative advantage because its veracity remains intact even if the exporting country is more (or less) efficient than the importing country in the production of everything. Thus as Viner (Ibid) points out, Martyn's insight leads to the theory of comparative advantage. 116 years later Ricardo picked up where Martyn had left off. He turned Martyn's partial-equilibrium into a general equilibrium model and articulated the theory of comparative advantage. However, in the years between Martyn and Ricardo, Adam Smith made a crucial observation regarding comparative advantage.

Adam Smith and Comparative Advantage

Of the five intellectual landmarks in this section, that of Smith is the least noticed and cited in the literature. Smith was aware of the eighteenth-century rule and applied it in the following passage in *The Wealth of Nations* (1776/1981, p. 458, WN) on free trade.

> By means of glasses, hotbeds, and hot walls, very good grapes can be raised in Scotland, and very good wine too can be made of them at about thirty times the expence for which at least equally good can be brought from foreign countries. Would it be a reasonable law to prohibit the importation of all foreign wines merely to encourage the making of claret and burgundy in Scotland? But if there would be a manifest absurdity in turning towards any employment thirty times more of the capital and industry of the country than would be necessary to purchase from foreign countries an equal quantity of the commodities wanted, there must be an absurdity, though not altogether so glaring, yet exactly of the same kind, in turning towards any such employment a thirtieth, or even a three-hundredth part more of either. Whether the advantages which one country has over another be natural or acquired is in this respect of no consequence.

At a first glance, it may be difficult to glean the eighteenth-century rule from this passage. However, Ruffin (2017, p. 21) shines a light by noting that Smith "did *not* say that it took 30 times the labor and capital used to produce grapes than in foreign country, but that it may take 30 times the expense of acquiring the same wine from abroad. He then said the same argument holds for a number significantly smaller than 30 times. Thus, he was just really talking about the gains from trade – the so-called eighteenth-century rule" (italics original). The passage implies that in order to decide whether to import a good or produce it domestically, we should compare the production cost of the good at home with the cost of purchasing it from another country rather than comparing it with the production cost abroad. Although Smith applies the eighteenth-century rule in the WN, he stops short of carrying the rule to its logical conclusion – the theory of comparative advantage.

Curiously, however, in the early part of the WN Smith advances an argument that – without the application of the eighteenth-century rule – leads to the comparative advantage outcome. He observes that both rich and poor countries produce manufactured and agricultural goods but the rich countries are more productive than the poor countries in *both* manufacturing and agriculture. He further observes that the rich countries' productivity advantage in manufacturing exceeds that in agriculture. His statement (1776/1981, p. 16) is as follows:

> The most opulent nations, indeed, generally excel all their neighbours in agriculture as well as in manufactures; but they are commonly more distinguished by their superiority in the latter than in the former. Their lands are in general better cultivated, and having more labour and expence bestowed upon them, produce more in proportion to the extent and natural fertility of the ground. But this superiority of produce is seldom much more than in proportion to the superiority of labour and expence. In agriculture, the labour of the rich country is not always much more productive than that of the poor; or, at least, it is never so much more productive, as it commonly is in manufactures. The corn of the rich country, therefore, will not always, in the same degree of goodness, come cheaper to market than that of the poor.

Smith goes on to say that "though the poor country, notwithstanding the inferiority of its cultivation, can, in some measure, rival the rich in the cheapness and goodness of its corn, it can pretend to no such competition in its manufactures; at least if those manufactures suit the soil, climate, and situation of the rich country" (Ibid, p. 17). Thus, the poor country – despite its productivity disadvantage – can rival the rich country in agricultural goods but not in manufactured goods in which its productivity disadvantage is even greater.

According to Smith's analysis – expressed in post-Ricardian terms – a country's comparative advantage lies where its absolute advantage is greatest or its absolute disadvantage is smallest. John Stuart Mill (1829-30/1844, p. 2) articulated the same propositions as follows:

> To render the importation of an article more advantageous than its production, it is not necessary that the foreign country should be able to produce it with less labour and capital than ourselves. We may even have a positive advantage in its production: but, if we are so far favoured by circumstances as to have a still greater positive advantage in the production of some other article which is in demand in the foreign country, we may be able to obtain a greater return to our labour and capital by employing none of it in producing the article in which our advantage is least, but devoting it all to the production of that in which our advantage is greatest, and giving this to the foreign country in exchange for the other. It is not a difference in the absolute cost of production, which determines the interchange, but a difference in the comparative cost.

Although these propositions are embodied in the passages of the WN presented above, Mill deduced them from Ricardo's formulation of the theory of comparative advantage to which we turn next.

David Ricardo and the Formulation of Comparative Advantage

Ricardo's contribution to the development of comparative advantage constitutes the most consequential intellectual landmark in the articulation of comparative advantage. He formulates the theory and presents a formal model based on Martyn's insight. Ricardo begins with the fact that for over a century – owing to the Methuen Treaty signed in 1703 – England had been trading her cloth for Portuguese wine. Morgan (2012, p. 45) notes that this trade had led to complete specialization – England produced cloth and no wine while Portugal produced wine and no cloth. The trade between the two countries provided Ricardo with the perfect backdrop for his formulation of the theory of comparative advantage. He assumes the cloth that England is exporting to Portugal requires "the labor of 100 men for one year and if she attempted to make the wine, it might require the labor of 120 men for the same time." Given these values, Ricardo (1817/2006. P. 94) notes, "England would therefore find it her interest [sic] to import wine, and to purchase it by the exportation of cloth". Ricardo's statement is a direct application of (and nothing more than) Martyn's insight that England stands to gain from the exchange regardless of any knowledge about the production costs of the two goods in Portugal. Since Portugal is trading with England, it too must be benefitting from trade. Hence, Ricardo (Ibid) adds Portugal to the model and assumes, "To produce the wine in Portugal might require only the labor of 80 men … to produce the cloth … might require the labor of 90 men for the same time". The application of Martyn's insight shows that Portugal also gains from trade since the exchange of wine for cloth saves Portugal 10 units of labor. Table 1 below presents Ricardo's model.

TABLE 1
LABOR CONTENT IN THE TRADED CLOTH AND WINE

	Cloth	Wine
England	100	120
Portugal	90	80

Notice, Portugal has an absolute advantage but the application of Martyn's insight shows that she gains from importing cloth. Thus, Ricardo (Ibid) writes,

> This exchange might even take place notwithstanding that the commodity imported by Portugal [cloth] could be produced there with less labor than in England. Though she could make the cloth with the labor of 90 men, she would import it from a country where it required the labor of 100 men to produce it, because it would be advantageous to her to employ her capital in the production of wine, for which she would obtain more cloth from England, than she could produce by diverting a portion of her capital from the cultivation of vines to manufacture of cloth.

Ricardo then makes a statement that in essence is the same as Smith's observation presented in the previous section. The statement is a deduction from his model. He (Ibid, p. 95) notes,

> It will appear, then, a country possessing very considerable advantages in machinery and skills, and which may therefore be enabled to manufacture commodities with much less labor than her neighbors, 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 labor than in the country from which it was imported. (Italics added)

Notice, in this seemingly passing remark Ricardo allows for partial specialization. To demonstrate this possibility, consider the following model. Suppose two countries Home (H) and Foreign (F) trade cloth (C) and Wine (W). Labor (L) is the only factor of production. In the following model, an "*" denotes the variables of the foreign country.

$a_C = (L_C / C)$, where L_C represents the required labor to produce C quantity of cloth (1)

$a_W = (L_W / W)$, where L_W represents the required labor to produce W quantity of wine (2)

Thus,

$1 / a_C$ = Quantity of cloth that a unit of labor produces (3)

$1 / a_W$ = Quantity of wine that one unit of labor produces (4)

Let us assume the Home country has an absolute advantage. That is,

$(1 / a_C) > (1 / a_C^*)$ (5)

and

$(1 / a_W) > (1 / a_W^*)$ (6)

Suppose Home's advantage is greater in C than it is in W. Hence, Home has a comparative advantage in C and Foreign has a comparative advantage in W.

Let P_c / P_w be the terms of trade between H and F, where P_c denotes the unit price of cloth and P_w denotes the unit price of wine. The terms of trade indicate the units of wine that can be exchanged for one unit of cloth. Prior to reaching international equilibrium, the following inequalities induce trade and demonstrate the gains from trade:

$P_c (1 / a_C) > P_w (1 / a_W)$ (7)

$P_c (1 / a_{C*}) < P_w (1 / a_{W*})$ (8)

According to (7) a unit of Home labor creates more value producing cloth than producing wine.

Similarly, (8) indicates that a unit of Foreign labor creates more value producing wine than producing cloth. These inequalities cause trade to continue to rise until an equilibrium is reached. Once in equilibrium, the following equalities hold:

$(P_c / P_w) = (a_C / a_W) = (a_C^* / a_W^*)$ (9)

The equalities in (9) are consistent with the optimal volume of trade at which specialization is partial. This result conforms with Ricardo's statement (quoted above) that despite her absolute advantage Home "imports a portion of the corn required for its consumption."

Haberler's Contribution

By the end of the nineteenth century, the labor theory of value came under criticism and lost its luster. This development cast doubt on the validity of Ricardo's comparative advantage model since it is firmly rooted in the labor theory of value. Haberler (1930/1985, p. 9) resolved the issue by applying the concept of opportunity cost to the Ricardian model. In this approach, the cost of a good is measured in terms of the foregone amount of an alternative output that could have been produced. Viewed this way, the values in Table 1 (above) represent, not just labor input, but all the resources used in the production process. The opportunity-cost approach reinforces the implication that every economy – regardless of its circumstances – can produce something at lower costs than a counter-part. To demonstrate this implication, suppose England trades C units of her cloth with W units of Portuguese wine. Given the labor inputs in the Ricardian model presented in table 1, 100/C and 120/W measure the required labor to produce respectively a unit of cloth and wine in England. The corresponding values in Portugal are 90/C and 80/W. These values can be employed to compute the opportunity costs of cloth and wine in England and Portugal, presented in Table 2, Thus, the production of a unit of cloth in England requires the sacrifice of 5/6 units of wine while in Portugal the corresponding value is 9/8.

TABLE 2
THE OPPORTUNITY COSTS OF CLOTH AND WINE

	Cloth	Wine
England	100/120 (W/C)	120/100 (C/W)
Portugal	90/80 (W/C)	80/90 (C/W)

Notwithstanding her absolute advantage, Portugal can produce only wine at a lower opportunity cost while England despite her absolute disadvantage produces cloth at a lower opportunity cost. Since the terms of trade (W/C) lies between the cost ratios, both countries gain from trade.

Ricardo applies his comparative advantage model to business firms and individuals. He (1817 / 2006, p. 95) writes,

> Two men can both make shoes and hats, and one is superior to the other in both employments; but in making hats he can exceed his competitor by one-fifth or 20 percent, and in making shoes he can excel him by one-third or 33 percent; – will it not be for the interest of both that the superior man should employ himself exclusively in making shoes, and the inferior man in making hats?

Simple calculations show that "the inferior man" despite his absolute disadvantage has a lower opportunity cost (and thus a comparative advantage) in making hats. Moreover, this model shows that division of labor based on comparative advantage would maximize output for a given amount of resources or minimize resources for a given amount of output. Both models (shoe-hat and cloth-wine) tell the same story.

The Deardorff-Dixit-Norman Theorem

Since Ricardo's model rests on two goods, two countries, and one factor of production, it is reasonable to ask whether the model remains valid in higher dimensions. In this regard, Ruffin (2002, 742) argues that the Ricardian model's "logical structure applies to *any* number of goods or countries" (italics original). The Ricardian model has also been scrutinized under various assumptions. In the vast literature on the subject, one seminal finding – by Deardorff (1980) and independently by Dixit and Norman (1980) – stands out.

Maneschi (1998, p. 14) has labeled it the Deardorff-Dixit-Norman (DDN) theorem. According to this theorem, in the words of Deardorff (1980, p. 942), there is "a negative correlation between any country's relative autarky prices and its pattern of net exports". That is, "on average, high autarky prices are associated with imports and low autarky prices are associated with exports." Deardorff calls this finding "the correlation result". The significance of this result is that it holds true regardless of the economic circumstances of the trading countries. That is, every country has a comparative advantage in some goods and comparative disadvantage in some others. In several subsequent works, Deardorff shows the correlation result remains valid for "final goods", "intermediate goods", "dated goods", "differentiated goods", and "services". Moreover, the correlation result holds true under the condition of "internal factor immobility" as well as "for all possible shapes of preferences".

However, Deardorff (2005) also notes that comparative advantage and the gains from trade may break down in the presence of domestic distortions and increasing returns to scale. He (2005, p. 1014) points out that a distortion (caused by an externality such as pollution) in the exports sector "may reverse the gains from trade". Of course, this would be the case if nothing were done about the distortion. Bhagwati and Ramaswami (1963) had already shown that a corrective measure (such as a tax) aimed at such distortion can restore the gains from trade, and comparative advantage will continue to direct the flow of goods and services. Concerning increasing returns, Ethier (1995, p. 55) notes, "*With increasing returns to scale, free trade might possibly be worse off for an individual country than autarky*" (italics original). Although this outcome – that free trade under increasing returns might make a country worse – is theoretically possible, it is not clear if it has ever materialized in reality as empirical investigations, presented in section 4 below, demonstrate that trade generally benefits the participating economies. More recently, Deardorff (2017) has expanded his analysis of comparative advantage into the digital world. He (p. 43) notes that "cross-border services" and "cloud services" do not "fit well into the Ricardian framework". He also questions "the relevance of comparative advantage for explaining the form of digital trade that builds on platforms whose success depends on network effects." It is not clear, however, that in such cases trade restrictions or regulations would benefit a country.

Comparative advantage explains trade among economies that differ from each other in technology (the Ricardian model) or resource endowments (the Heckscher-Ohlin model). But Linder (1961) as well as Grubel and Lloyd (1971) find that in the post-World War II era, the bulk of international trade took place among countries that were fairly similar to each other. The intellectual efforts to puzzle out this phenomenon led to the development of New Trade Theory that – in the words of Krugman (2009, p. 569) – pointed to "the rising role of increasing returns, as opposed to comparative advantage, in the growth of trade after 1950." However, the entry of low-wage countries – most notably, China – into the global markets in recent decades has brought back comparative advantage as the basis for a substantial portion of trade. As Krugman (2009, p. 570) further notes, "nobody doubts that trade between the United States and Mexico, where wages are only 13 percent of the US level, or China, where they are only about 4 percent, reflects comparative advantage rather than arbitrary, scaled-based specialization." The New Trade Theory has supplemented comparative advantage as the impetus for trade.

ADDING WAGE AND EXCHANGE RATES TO THE RICARDIAN MODEL

The validity of comparative advantage theory is independent of variables such as the wage and exchange rates. For an illustration, suppose the English wage in autarky is initially fifty percent of the Portuguese wage. If we set the wage in Portugal to 1, the wage in England would be 0.5. If we apply these wage rates to the labor inputs in the Ricardian model in Table 1, we will obtain the cost of cloth and wine in England and Portugal, presented in Table 4.

TABLE 4
COST OF C QUANTITY OF CLOTH AND W QUANTITY OF WINE

	Cloth	Wine
England	50	60
Portugal	90	80

In this scenario, England produces both goods at lower costs and exports them to Portugal, triggering changes in the labor and currency markets. The demand for English labor rises, pushing the wage upward while the opposite occurs in Portugal, narrowing the wage gap between the two countries. Since a one-way trade is impossible, the English wage continue to rise until the production cost of one of the goods in England becomes higher than in Portugal. Suppose the English wage reaches seventy percent of the Portuguese wage. In this case, the cost of English cloth is 0.7 x 100 = 70 and that of wine is 0.7 x 120 = 84. Trade will now run both ways as England exports cloth and imports wine. The movements in the exchange rate between the two countries will reinforce the changes in the labor market as the English Pound appreciates relative to Portuguese Escudo.

Eaton and Kortum (2012, p. 72) introduce a different scenario. They assume the wage in England is eighty percent of that in Portugal. These values do not change the pattern of trade since cloth remains cheaper in England and wine in Portugal. Eaton and Kortum then change this scenario by assuming that "one-third of the cloth shipped from England to Portugal is ruined by saltwater in transport." In that case, "1.5 units of cloth need to be shipped to deliver 1 useable unit to Portugal, raising the cost of English cloth to 120." Given this, it "no longer pays for Portugal to import cloth from England rather than making it at home." But this scenario does not necessarily lead to autarky because wine is still cheaper in Portugal and it is in England's interest to import it. Such a trade (England importing wine while exporting nothing), however, would depreciate the value of English pound and lower the price of English cloth in world markets. Falling wages in England and rising wages in Portugal would reinforce the movements in the currency market leading to an equilibrium at a smaller trade volume due to the higher costs resulting from the damage to the cloth in transit. Eventually, it will be in the interest of Portugal to import cloth even though one-third of it is ruined in transport. Thus, the forces of comparative advantage – aided by the endogenous movements in the currency and labor markets – continue to direct the flow of goods and services.

IMPLICATIONS AND EMPIRICAL EVIDENCE

A central implication of comparative advantage, in the words of Ruffin (2002, p. 734), is that "Every country has a place at the table of world markets, no matter how high the country's competitively determined wages or how poor its circumstances of production…" Accordingly, even economies that have an absolute disadvantage in everything still have a comparative advantage in something. In a broad sense, this implication is vindicated by the fact that all countries to varying degrees participate in global markets. However, to determine the validity of comparative advantage, numerous empirical works have scrutinized the real-world data in light of the theory. A direct test of the Ricardian model faces the challenge of identifying a country that had adopted autarky at some point but subsequently abandoned it and entered the world economy. Japan's experience between the seventeenth and the nineteenth centuries perfectly fits such description. From 1603 to 1858, the country cut off herself from the rest of the world. Then under the U.S. (military) pressure, she ended the isolation. Lindert and Williamson (2000, p. 7) describe this episode as:

> Probably the greatest nineteenth century "globalization shock" … Japan switched from virtual autarky to free trade in 1858. It is hard to imagine a more dramatic switch from closed to more open trade policy. In the fifteenth years following 1858, Japan's foreign trade rose 70 times, from virtually nil to 7 percent of national income.

Bernhofen and Brown (1994, p. 48) regard "Japan's sudden and complete opening up to international trade in the 1860s" as a "natural experiment" for testing comparative advantage. They apply the Deardorff-Dixit-Norman theorem to Japan's entry into the world markets and find that Japan's trade pattern after 1858 corresponds to the "correlation results" described in section 2 above.

Another important test of the Ricardian theory is the work of Costinot and Donaldson (2012, p. 485) who assess "the empirical performance of Ricardo's ideas across 17 agricultural crops and 55 agriculture-producing countries in 1989." The authors ask, "How do output levels predicted by Ricardo's theory compare to those that observed in the data?" (p. 458). In a Ricardian world with a perfect empirical model and perfect data, a regression of predicted output on actual output will generate a slope coefficient of one. But the world economy is too complex to generate such a neat result. Costinot and Donaldson note that the "estimated slope coefficient is 0.212 and the standard error is small (0.057). While the slope coefficient falls short of its theoretical value (one), it remains positive and statistically significant."

Krugman (1998, p. 22) states another key implication of comparative advantage as follows: "trade between two nations normally raises the real incomes of both". Trade increases the real income because, as noted before, it generates static and dynamic gains. For example, Eaton and Kortum (2012) estimate the static gains by applying the Ricardian framework to the manufacturing sector in twenty-five countries in 2006. The authors (2012, p. 82) note, the "gains form trade are substantial, particularly, for small countries: for example, over 25 percent of income for Denmark, Estonia, and Hungary. For large countries, Japan and the United States, gains from trade amounted to 2-3 percent of GDP 20 years ago. But those gains are now over 50 percent higher."

With regard to the dynamic gains, trade stimulates economic growth via the transfer of capital, technology, and ideas across countries. In the vast literature on this theme, I will cite only a few seminal works. In the following passage, Grossman and Helpman (1991, 166-67) describe the contribution of international trade to the local stock of knowledge, a necessary ingredient for economic growth.

> It is plausible to suppose that the foreign contribution to the local knowledge stock increases with the number of commercial transactions between domestic and foreign agents. That is, we may assume that international trade in tangible commodities facilitates the exchange of intangible ideas. This assumption can be justified in several ways. First, the larger the volume of international trade, the greater presumably will be the number of personal contacts between domestic and foreign individuals. These contacts may give rise to an exchange of information... Second, imports may embody differentiated intermediates that are not available in the local economy. The greater the quantity of such imports, the greater perhaps will be the number of insights that local researchers gain … Third, when local goods are exported, the foreign purchasing agents may suggest ways to improve the manufacturing process … it seems reasonable to assume therefore that the extent of the spillovers between any two countries increases with the volume of their international trade.

More recently, a number of researchers have shown that trade contributes to economic growth by speeding up the Schumpeterian process of innovation. For example, Melitz and Redding (2021, pp. 2-3) identify the following "Four main mechanisms for these dynamic welfare gains from trade":

> First, international trade expands the market size accessible to firms … Second, international trade increases product market competition as the producers from different countries enter one another's markets…
>
> Third, international trade induces specialization according to comparative advantage, as in the conventional theories of trade … Fourth, international knowledge spillovers can directly affect countries' rate of economic growth, and international trade in goods itself can be a conduit through which ideas spread around the world.

Irwin (2019) summarizes the findings of numerous studies on the extent to which trade reforms (i.e., reducing or removing barriers to trade) have affected economic growth since the early 1980s. He (2019, p. 21) notes, "For developing countries that are behind the technological frontier and have significant import restriction, there appears to be a measurable economic payoff from more liberal trade policies … economic growth is roughly 1.0 – 1.5 percentage points higher than a benchmark after trade reform." Additional implications of comparative advantage are as follows.

- Fewer restrictions on international trade result in deeper and finer division of labor across countries and increase productivity.
- If an economy acquires a comparative advantage in the production of a good and begins to export it, then at no fault of its own it might lose its ability to export another good (one with the smallest comparative advantage). This possibility results from the implication that it is impossible to have a comparative advantage in all goods.
- An extension of the above implication is that business firms that acquire a comparative advantage in a new product might lose their comparative advantage in an existing product.
- Business firms that specialize according to their comparative advantage improve their chances of success in a competitive environment since production based on comparative advantage minimizes costs for a given amount of output.
- A business firm could gain from purchasing a product (or outsourcing a service) even though it might be able to produce (or perform) it more efficiently than any other business.

A FINAL NOTE

To illustrate the significance of comparative advantage, consider a counterfactual scenario in which absolute (rather than comparative) advantage directed global trade. In this hypothetical world, highly productive economies (that have an absolute advantage in nearly all goods) as well as highly unproductive economies (that have an absolute disadvantage in almost all goods) would be largely cut off from the world economy. The first group would not import much (thus not export much either) and the second group would not export much (thus not import much either) The economies that lie between these two extremes would engage in moderate amount of trade. Consequently, the volume of global trade under absolute advantage would be significantly lower than that based on comparative advantage. This scenario would entail enormous economic cost owing to reduced static and dynamic gains from trade. Indeed, we would be living in a very different (and comparatively impoverished) world. But the prevalence of free trade areas as well as nearly $35 trillion worth of global trade in 2025 (roughly one-third of world output) and the fact that virtually every country engages in trade – all these factors – point to comparative advantage as the primary (although not the sole) force directing international trade. In the following passage, the economic historian Brad DeLong explains the role of comparative advantage over the period 1870 – 1914 during which international trade rose enormously. He (2022, p. 49) writes,

> The growth of trade meant that … Wherever there was a difference across two countries in the value of textiles relative to ironmongery – or any other two nonspoilable goods – there was profit to be made and societal well-being to be enhanced by exporting the good that was relatively cheap in your country and importing the good that was relatively dear … The reach of comparative advantage was also broad. A country near-hapless in growing food but even less capable of making machine tools could improve its lot by exporting food and importing machine tools. A country that was best in class at making automobiles, but even better, in relative terms, at making airplanes, could get ahead by exporting airplanes and importing cars. Such was the power of expanding world trade. Whether one's comparative advantage came from innovative entrepreneurs, a deeper community of engineering practice, a well-educated workforce, abundant natural resources, or just poverty that made your labor cheap, business could profit and society grow richer. And so

the surge in real wages was worldwide, not confined to where industrial technologies were then being deployed.

The logic of comparative advantage in DeLong's statement applies to all periods in history and to all places as well as to the operation of business firms and management practices.

ENDNOTES

1. One conference sponsored by "Ricardo Society Japan" held in Okinawa and the other organized by Jones and Weder in Basel, Switzerland. For the proceedings of the first conference see Senga (2017) and for the second one, see Jones and Weder (2017). For the edited book, see Evenett (2017).
2. According to Mokyr (2009, p. 18), in England "between 1622 and 1700 both imports and exports just about doubled".
3. For the 1699 legislation, see Levinson (2020, p. 22). For the one in 1701, see Acemoglu and Robinson (2012, p. 200).
4. Samuelson made this observation regarding comparative advantage, not Martyn's insight. As we shall see, however, the theory of comparative advantage is embedded in the insight.
5. Exceptions include Elmslie (1994) and Rassekh (2015).
6. Robert Malthus failed to understand this subtle point even after Ricardo explained it to him. See Viner (1937, p. 441).
7. For a mathematical expression of Smith's observation of comparative advantage, see Rassekh (2025).
8. Mill wrote this essay (along with several others) in 1929-30 but published them in 1844.
9. According to this treaty, "England had preferential access for cloth exports to Portugal in exchange for reciprocal preferences for Portuguese wine exports to England" (Findlay and O'Rourke 2007, 252).
10. The model draws on Maneschi (2004).
11. For a summary of the criticism, see E. S. Mason (1926).
12. For a concise summary of these works, see Deardorff (2005).
13. Hall and Soskice (2001) argue that institutions (primarily economic systems) bestow comparative advantage on the type of innovations that countries create.
14. As examples of such works, see McDougall (1951), Stern (1962), Balassa (1963), and Golub and Hsieh (2000).
15. In addition to Melitz and Redding (2021), see Akcigit and Melitz (2021) for a survey of the theoretical and empirical literature.
16. Rassekh (2007) finds that in sample of 150 countries, a greater portion of the dynamic gains, generated by trade accrue to the lower-income countries.
17. For an elaboration on the managerial implications of comparative advantage, see Ghemawat (2017).

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