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Review

USA–China Trade War in Light of the Limits of the Comparative Advantage Principle

Kone

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USA–China Trade War in Light of the Limits of the Comparative Advantage Principle

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Abstract

The trade war, which antagonizes today the United States and China, questions the free trade principle in international trade. To show the dangerousness of this trade war for the world economy, this paper explores the theoretical limits of the comparative advantage principle by analyzing the limitations of the applicability of the comparative costs and endowments criteria. We conclude that the international trade theories not based on the comparative advantage principle are the exception to the rule and therefore, cannot be used to justify the American positions, except to introduce a certain degree of political considerations. Specifically, we show that the international trade theories, other than the Ricardian theory and the HOS factorial theory, are exceptions to the applicability of the comparative costs and endowments criteria. In light of this argument, one should seek explanations of the war-like trade logic of the Trump Administration in the international political economy. In this perspective, international trade is no longer necessarily a positive-sum game.

Keywords: Trade war; Comparative advantage; Positive-sum game.

1. INTRODUCTION

Since his election as head of the United States of America (USA), Donald Trump has consistently undermined the principle of free trade. Based on the argument that the USA's trade deficits vis-a-vis its major partners (such as China, European Union countries, Japan, Canada, and Mexico) are unfair and inequitable, Trump has been adopting in place what he considers as corrective policies. For example, as early as 2017, before his election, he questioned the North American Free Trade Agreement (NAFTA) in its format. In 2018, he charged high digressive tariff on the imports of steel from Europe, China, and Japan, with a derogation for Canada and Mexico. These so-called corrective policies have received similar responses by the concerned countries. With regard to China, these increases of tariff have led to reprisals and counter reprisals between her and the USA.

The consequences of a trade war are well known among economists: decrease in imports, decrease in exports, and decline in the standard of living of the world population especially the economies highly dependent on outside countries as those of Africa, contraction of economic activities through various channels. In short, there is no need to dwell on the dangerousness of a trade war nowadays, especially in a multi-polar world, over-armed and with mass destruction weapons ever matched in human history. However, this escalation of reprisals and counter reprisals, very characteristics of a trade war, lead to a reconsideration of the free trade principle.

Free trade is one of the pillars of the economic theory of international trade. Its interpretation is based on the application of the comparative advantage principle since Ricardo (1817). According to this principle,

the advantage for a country to participate in international trade is based on the fact that every country wins. Even though a country has an absolute advantage in producing all the goods, it cannot have a comparative advantage for all the goods. This simple principle, nontrivial according to Samuelson, is yet regularly called into question.

The questioning aforementioned opens, in reality, the old debate on the relevance of the trade principle in international trade. In fact, many authors, including some world-renowned economists, such as Samuelson, think that the conclusions of the imperfect competition models allow us to question or at least nuance the free trade principle. It is a tendency to legitimize domination and violence relationship in international trade as defended by the mercantilism. Thus, for example, Bourguinat (2005) paper's title refers to the following question: "*The free-exchange: a paradigm in situation of discomfort?*" It is not the only citation in his article, referring also to Samuelson Act II who considers that one of the effects of globalization may be the USA and Europe terms of trade deterioration.

1.1. What Can We Say About Economic Theories of International Trade?

Our objective in this work is to show that only the comparative advantage principle is a general feature. The criteria proposed by other theories of international trade are either at best based on exception elements of the comparative advantage principle, the applications not using the cost of production for their comparison. In other words, we seek to show that any theory of international trade is an exception theory or an extension of the comparative advantage principle in specific situations.

First, we analyze the limits of the applicability of the criterion of the comparative costs and factorial endowments. Second, we establish a relationship between these limits and the new theories of international trade (imperfect competition), namely the neofactorial and neotechnology theories.

The remainder of the paper is organized as follows. In the second section, we present a brief literature review. In the third section, we analyze the limits of the relative costs and opportunity costs' criteria. In the fourth section, we analyze the limits of the factorial endowments' criteria. The fifth section presents our arguments on these limits in line with the Ricardian basic model.

2. A BRIEF LITERATURE REVIEW

To respond to the mercantilists such as Bodin, Montchrestien, and Petty, who consider the international trade as a zero-sum game, even negative, Smith presents in his book "*The Wealth of Nations*" a contrary argument: the international trade is a positive-sum game. To prove that, he developed the concept of specialization based on the country's productive advantage principle that can be determined by comparing the direct costs of production. The disadvantage of using this criterion to determine the country's productive advantage is that a country can have, for all goods, lower costs than the other countries. This brings back in some way to the idea of international trade with the zero-sum game or to a nontrade situation.

To overcome this deadlock, David Ricardo had the idea to determine the country's advantage on the basis of relative costs, considering the country's advantage as a comparative advantage. The principle of determining the structure of an advantageous international trade for all countries participating (positive-sum game) is thus the principle of comparative advantage. It allows to show that the advantage refers to the fact that international exchanges are free of any unnatural obstruction (free trade).

The discussions on the relevance and effectiveness of this principle have never been stopped among scholars and also practitioners of international trade. International trade and economy books present nowadays an evolution of these debates that can be structured around two possible great periods: a first phase based on theoretical analysis and a second phase based on empirical analysis.

The theoretical discussions on the comparative advantage principle started since the publication of Ricardo's work on the "*Principles of Political Economy and Taxation*" in 1817. Since then, two currents have emerged: the questioning of the comparative advantage principle and the accuracy of the conditions of its implementation and its excess. Most of the arguments put forward by those who want to undermine the comparative advantage principle are in line with the mercantilism and of Marxist inspiration as Emmanuel

(1969) with his work on the unequal exchange. However, we leave aside this current of thoughts and focus on the one promoting the comparative advantage principle. The evolution of the theoretical discussions on the comparative advantage principle has three major steps.

The first step was to clarify the conditions of its application by the first Neo-Classics. Thus, Mill (1848) took into account the application and the determination of the terms of trade. Senior (1850) considered the wage rate in his analysis. All these precisions have led to a better understanding of the comparative relative costs that became the opportunity costs.

The second step was to strengthen the relevance of the comparative advantage principle by first taking into account more than a factor of production as popularized by Heckscher (1919), then by Ohlin (1933), and then synthesized and formalized by Samuelson (1950). This step has not only shown that the comparative advantage principle is not dependent on the theory of Value-Labor but also has shown that differences in capital and labor endowments of the countries represent a relevant alternative criterion for its determination.

The third step is carried out in three phases by taking into account the following: (1) the dynamics and the reversal of the comparative advantages, (2) the difference in domestic demand for the homogeneous goods, and (3) the market structures. The consideration of comparative advantages dynamics and reversals has led to technological gap theories (Posner, 1961) and the products' life cycle theories (Vernon, 1966). These theories help to explain the existence of trade between countries with very similar technologies. These authors based their analysis on the expenditures in Research and Development and the monopolistic advantage offered by the technological gaps. Similarly, these theories allow to take into account "the constant change in the productions conditions."¹ The consideration of the differences in the national applications of homogeneous goods led to the theories of the representative domestic demand sector (Linder, 1961) and to analysis on the difference in demand (Lassudrie-Duchêne, 1971). These theories can explain the existence of trade between countries with the characteristics of similar technologies but which domestic demands are different. They also tend to give importance to political boundaries (sovereignty). The consideration of the domestic market structures becomes significant in the 1960s and more systematic in the 1970s as shown by various authors' works. For example, Krugman (1979, 1980, 1995) and Graham (1923) earlier contributed to this issue. Its development based on the application of imperfect competition models to international trade analysis is mainly made in two main directions: the oligopolistic and the monopolistic competition. This consideration highlights new determinants of international trade as economies of scale, the differentiation of goods, and an increase in competition. These theories have the advantage of being able to explain the existence of trade between countries with strictly similar characteristics. However, they lead to the indeterminacy of the international trade direction.

The empirical debates on the comparative advantage principle are much newer than the theoretical debates. Indeed, the first empirical tests of the comparative advantage principle are from the 1950s. Three major stages can be distinguished in the evolution of the empirical arguments on the issue: (1) the first empirical tests for confirmation of the Ricardian and factorial models, (2) the synthesis tests on these models, and (3) the new tests of the determinants of international trade.

The first empirical tests for verification of the comparative advantage principle are divided into two parts²: the verification tests of the Ricardian model and those of the factorial model. The first empirical test of Ricardo's model is performed by MacDougall (1951). He wanted to check, in the case of the United Kingdom and the United States, using the data from 25 industries of the year 1937. The second test performed by Stern (1962) focused on the data of 20 industries of the year 1950, always for trade between the United Kingdom and the United States. Balassa (1963) reproduced the same test on a sample of 39 industries of the year 1950. The results of these tests generally confirmed the comparative advantage principle to the Ricardo one. However, their relevance has been challenged by several authors both for their theoretical approach and their statistical method. These challenges led to other empirical tests that did not confirm the validity of the Ricardian comparative advantage principle, namely a positive link between the productivity of assets and their share in the volume of exports or a negative relationship between the wage rates and the shares of

¹ Humbert (1980)

² See for example Mucchielli (1989)

exporters of the sectors. The first empirical tests to verify the comparative advantage principle according to the factorial model were conducted by Leontief (1954 and 1956). These first verifications led to what has become the Leontief Paradox; namely that the United States, known for its relative scarcity of work in 1947, exported products whose production was relatively more labor-intensive. Criticism of these first empirical tests is numerous and various. What must be retained is that these first tests led to the recognition of a share of the labor factor, initially recognized by Leontief as part of the capital factor. However, this share can be seen as a factor related to the skill of the labor factor, which is human capital.

The theoretical and empirical dissatisfaction arising from these initial tests has prepared the ground for new tests called the synthesis test by Mucchielli (1989) on the Ricardian and factorial models. Furthermore, the will to learn from the first tests of the comparative advantage principle (improvement and deepening of the statistical methodology), the empirical synthesis tests also seek to better reflect the Ricardian and factorial theoretical basic models. They also take into account the new neofactorial and neotechnological theoretical considerations. These new empirical tests are numerous and various (Kenen, 1965 and 1970; Keasing, 1965 and 1966; Krueger, 1968; Deardoff, 1984; Golub and Hsieh, 2000; Kowalski, 2011; Costinot *et al.*, 2012). Despite this multiplication of the empirical tests on the comparative advantage principle, their importance in explaining the current trade flows is steadily falling, so that Wood (1994a) recognizes the need to give a chance to Heckscher and Ohlin approach. In reality, the results of the empirical tests on the principle of comparative advantage are not definitive.

The empirical tests on intraindustry trade. This relative decline of the comparative advantage principle in the empirical explanation of international trade prepared the way for empirical verification tests of the imperfect competition models. The empirical tests on the markets' structures as determinants of international trade are numerous and various. These tests tend to give more importance to the structures as a determinant of international trade. Thus, for example, Fontagné, Freudenberg, and Gualier (2005) notice an increase in the intraindustry trade even if there is a resumption of the interbranch trade due to *"the increased participation of emerging countries in the global trade."*

On a theoretical level, these tests have led some economists to raise the question about the relevance of the comparative advantage principle, today. This criticism is stronger from the angle of trade policy and especially from the USA. Indeed, since the mid-1980s, new arguments questioning the supremacy of free trade are based on the work of authors such as Culbertson (1986) or Samuelson (2004). The line of defense of the new American protectionism lies in taking into account the losses that free trade brings. For Culbertson (1986), free trade has negative effects that come from a variety of sources: illegal competition, wage competition, and the disruption of US supply and demand. For Samuelson, taking into account the adjustment effect of the labor factor in a dynamic approach means that the total gains of free trade cannot be greater than the total losses that it generates when there is a reversal of comparative advantage. These losses result mainly from the deterioration of the terms of trade see for example Rainelli (2015).

3. LIMITS OF APPLICABILITY OF THE CRITERION OF THE RELATIVE AND THE OPPORTUNITY COSTS

Conventionally, the principle of comparative advantage is applied based on the criterion of costs or opportunity costs. We will take into account the two aspects.

3.1. The Basis Ricardian Model

Consider a world with two countries (A and B) and two homogeneous goods (X and Y). Suppose that each country can produce each of the two goods from a homogeneous factor of production (labor) perfectly mobile between the two sectors and perfectly still between the two countries. Suppose that the production technologies of both homogeneous goods in both countries are different so that the unit production costs of each good are different; meaning that ($a_i^A \neq a_i^B$ with $i = \{X, Y\}$). Suppose further that these unit costs are constant; it means that the costs are independent of the level of the production of each good.

To determine the structure of international trade in that world, let us summarize the above presentation, about the production, with a technical Table 1.

To the question to know what is the structure of international trade in this world, it is easy to answer to it for any postgraduate student, as long as the unit costs values are explained.

In particular, according to the principle of comparative advantage, for a given homogeneous good, the country that will have the relative cost $\left(C_{r,i}^j = \frac{a_i^j}{a_n^j}; n \neq j = \{A, B\} \text{ and } i = \{X, Y\} \right)$ or the opportunity cost (let us say X good in terms of Y good) $\left(C_{oX/Y}^j = \frac{a_i^j}{a_n^j}; j = \{A, B\} \text{ and } n \neq i = \{X, Y\} \right)$ the lowest will have to produce and export this good and will import the good for which its relative or its opportunity cost is the highest.

In terms of trade, this would mean that even if the USA has higher productivity levels than China (or vice versa) for all production sectors, both countries can still trade and benefit from trade international. The condition would be that these international exchanges take place on the basis of free trade. In addition, earnings are insured for each of them, regardless of the state of their mutual trade balance.

3.2. Ricardian Model with Equality of Gaps of Productivity

Over the previous assumptions, suppose that the unit costs in each sector, although different, are proportional between the two countries. In particular, suppose that $a_X^B = k_1 \cdot a_X^A$ and $a_Y^B = k_2 \cdot a_Y^A$. In those circumstances, the principle of the comparative advantage is not applicable in all cases, because the criterion of the relative costs and opportunity costs are applicable if and only if $k_1 \neq k_2$.

To show this, let us consider Table 2 by explaining the proportional relationship of the unit costs of production.

The expression of the relative costs of the good X (respectively, of good Y) from the point of view of country A would be then the next:

$$C_{r,X}^A = \frac{a_X^A}{a_Y^A} = \frac{a_X^A}{k_1 \cdot a_X^A} = \frac{1}{k_1} \text{ (respectively, } C_{r,Y}^A = \frac{a_Y^A}{a_X^A} = \frac{a_Y^A}{k_2 \cdot a_Y^A} = \frac{1}{k_2} \text{)} \tag{2.1}$$

We find then that these two relative costs give rise to an arrangement order if and only if $\frac{1}{k_1} \neq \frac{1}{k_2} \Rightarrow k_1 \neq k_2$

Table 1. Unit Costs of Production for Each Good in Country A and Country B.

Goods \ Countries	A	B
X	a_X^A	a_X^B
Y	a_Y^A	a_Y^B

Table 2. Unit Productions Costs of Each Good in Countries A and B with Gaps Proportionality.

Goods \ Countries	A	B
X	a_X^A	$k_1 a_X^A = a_X^B$
Y	a_Y^A	$k_2 a_Y^A = a_Y^B$

Similarly, the expression of opportunity costs of the good X in terms of the good Y from the point of view of country A (respectively, of country B) would be then the following:

$$C_{oX/Y}^A = \frac{a_X^A}{a_Y^A} \text{ (respectively, } C_{oX/Y}^B = \frac{a_X^B}{a_Y^B} = \frac{k_1 \cdot a_X^A}{k_2 \cdot a_Y^A} \text{)} \quad (2.2)$$

Thus, we find that these two opportunity costs give rise to an arrangement order if and only if $\frac{k_1}{k_2} \neq 1 \Rightarrow k_1 \neq k_2$

In short, when there is an equality in the gaps of the performances of the two productive sectors between the two countries of that world, it is no more possible to predict the structure of the principle of comparative advantage using the criterion of the relative or the opportunity costs.

4. THE LIMITS OF APPLICABILITY OF THE PHYSICAL AND MONETARY CRITERION OF THE FACTORIAL ENDOWMENTS

The principle of the comparative advantages can be applied by using the differences of countries A and B in their factorial endowments.

4.1. The Factorial Basic Model

Suppose a world with two countries (A and B) and two goods (X and Y). The two countries have the same technologies for the production; In short, the production function of each good is assumed to be identical for both countries. However, the two countries are differently endowed with capital and labor inputs. In addition, it is assumed that the production of one of the two goods (we say X) is more intensive in labor than the other (we say Y), regardless of the evolution of the remuneration of the production factors. Finally, it is assumed that the usual assumptions about technology and the technical constraints (1—each country produces each good from two factors, 2—the factors of production are substitutable in the production of each good, and 3—the technology is convex) are real. In this case, according to the theorem of Heckscher–Ohlin, it is possible to predict the structure of international trade in that world. In particular, according to this theorem, a country will have a comparative advantage for the good whose production is intensive in the production factor for which it is relatively abundantly endowed. It can export it. Conversely, this country will have a comparative disadvantage for the good whose production is intensive in production factor for which it is relatively sparsely endowed. It can import this good.

Two conditions enable to establish the relative abundance of a country in a given production factor: the physical and the monetary conditions. It is assumed that countries A and B are provided with a fixed amount of labor ($L^i; i = \{A, B\}$) and capital ($K^i; i = \{A, B\}$). Suppose further that the production of one unit of each good requires a certain amount of labor ($l_j^i; i = \{A, B\}$ et $j = \{X, Y\}$) and a certain amount of capital ($k_j^i; i = \{A, B\}$ et $j = \{X, Y\}$). Let us summarize the information in Tables 3 and 4.

$$\frac{L^A}{K^A} > \frac{L^B}{K^B} \quad (3.1)$$

The production of the good X will be said relatively more intensive in labor than the production of the good Y, if and only if

$$\frac{k_X^A}{l_X^A} < \frac{k_Y^A}{l_Y^A} \quad (3.2)$$

Table 3. Initial Endowments of Countries A and B in Labor and Capital Inputs.

Input \ Countries	A	B
Labor	L^A	L^B
Capital	K^A	K^B

Country A is said better endowed in labor than country B, if and only if

Table 4. Factorial Intensities in Country A.

Good \ Countries	Labor	Capital
X	l_X^A	k_X^A
Y	l_Y^A	k_Y^A

Table 5. Unit Cost of the Production Inputs Labor and Capital in Countries A and B.

Price of an input unit \ Country	A	B
Labor	w_A	w_B
Capital	r_A	r_B

The previous inequality remains valid for country B $\left(\frac{k_X^B}{l_X^B} > \frac{k_Y^B}{l_Y^B}\right)$ under the assumption that the two countries have the same technology and this inequality is independent of the prices of labor and capital.

With these two relations of inequality, according to the theorem of Heckscher–Ohlin, country A has a comparative advantage for good X, it can export it. Conversely, country A has a comparative disadvantage for good Y that it will import.

This result can be also established even if only the prices of production factors are known. To do this, suppose that the price of the provided service by a unit of labor input is w and that the price of the provided service by a capital unit is r . Instead of the previous Table 4, we will have the following Table 5.

In that case, country A will be said relatively better endowed in labor input than country B, if only if

$$\frac{w_A}{r_A} < \frac{w_B}{r_B} \tag{3.3.}$$

These two criteria of the principle of comparative advantage can be applied even if the differences in production costs of the two goods in both countries are equal. However, these two criteria of comparison may become ineffective in the presence of conditions of proportionality (in physical and monetary terms) of endowments of the countries.

Table 6. Initial Endowments of Countries A and B in Labor and Capital Inputs with Proportionality of Their Differences by Sector.

Input \ Countries	A	B
Labor	L^A	$L^B = m_1 L^A$
Capital	K^A	$K^B = m_2 K^A$

Table 7. Unit Cost of Labor and Capital Production Inputs in Countries A and B with Proportionality of Their Differences by Input.

Input \ Country	A	B
Labor	w^A	$w^B = m_1 w^A$
Capital	r^A	$r^B = m_2 r^A$

In terms of trade, when the United States and China have proportional productivities, their differences in staffing are sufficient to prove that trade on the basis of the principle of free trade is advantageous for both. Earnings are insured for each of them, regardless of the state of their mutual trade balance.

4.2. The Factorial Model with Equality of the Endowments Differences and/or of the Unit Factorial Costs

If we introduce a relation of equality in the differences of the factorial endowments and in the differences of the prices of provided services by a unit of these factors, it becomes impossible to determine the structure of international trade based on the principle of comparative advantage.

To show it, let us add to the described world below, the assumption that although the quantities of labor and capital that are endowed by countries A and B are different, there is, however, a proportionality in their differences. In the presence of this assumption, Table 4 is modified as Table 6.

In these conditions, the inequality (3.1) becomes the following:

$$\frac{L^A}{K^A} > \frac{m_1 L^A}{m_2 K^A} \text{ either } \frac{L^A}{K^A} \neq \frac{L^B}{K^B} \text{ if and only if } m_1 \neq m_2 \tag{3.4}$$

Consequently, if $m_1 \neq m_2$, it is not possible to apply the principle of comparative advantage to determine the structure of international trade between countries A and B in that world.

Similarly, if the same type of relationship of proportionality exists between the differences in prices of the provided services by a labor unit and a capital unit in both countries, it will be impossible to apply the principle of comparative advantage to determine the structure of international trade between them. In the presence of an assumption of proportionality, Table 5 is modified as Table 7.

In that case as well, the principle of comparative advantage can be applied only if $m_1 \neq m_2$. Indeed, an order of magnitude can be found between $\frac{w^A}{r^A}$ and $\frac{w^B}{r^B}$; it is necessary that $m_1 \neq m_2$.

In short, when the differences in endowments of countries, in labor and capital inputs, or when the differences in prices for provided services by their unit are equal between the two countries, the principle of comparative advantage is no longer applicable because the comparison criterion cannot be used to obtain an order of magnitude.

5. THE COMPLEMENTARITY OF THE DIFFERENT MODELS OF INTERNATIONAL TRADE

On the basis of what we have shown, can we conclude to the superiority of the new theories of international trade on the traditional theories?

We will reply in the negative to this question. In particular, it is possible to see in the new international trade theories (neotechnologies, neofactorials, and imperfect competition) specific cases or exceptions to the application of the principle of comparative advantage. Specifically, these theories are complementary to the traditional theories of international trade and are not alternative to them.

To show it, note that there is an infinite number of situations in which, it will be impossible to apply the principle of comparative advantage based on the differences in technologies, because $k_1 \neq k_2$ is possible for any $k_1, k_2 \in \mathbb{R}^+ - \{0\}$.

As well, it appears also that there is an infinite number of situations in which, it will be impossible to apply the principle of comparative advantage based on the differences of endowments depreciation and (or) on the differences in their unit costs because $m_1 \neq m_2$ is possible for any $m_1, m_2 \in \mathbb{R}^+ - \{0\}$.

5.1. Complementarity between Ricardian Model on One Hand, and Neotechnological Theories and Neofactorial Theories on Other Hand

The analyses of international trade based on the differences in technologies and those based on human capital can be understood as representative cases of all exceptions to the principle of comparative advantage, except in cases where countries A and B have strictly identical characteristics in production and in consumption. In particular, these two categories of theories explore possible explanations to international trade when $k_1 = k_2$ with $k_1, k_2 \in \mathbb{R}^+ - \{0, 1\}$ (case analyzed by neotechnological models) or when $m_1 = m_2$ with $m_1, m_2 \in \mathbb{R}^+ - \{0, 1\}$ (case analyzed by neofactorial models).

Let us analyze the possible ways to resolve the problems of impossibility of comparison posed by these two cases in the analyses of international trade.

First case: it is assumed that $k_1 = k_2$ with $k_1, k_2 \in \mathbb{R}^+ - \{0, 1\}$. The neotechnological models appear as the archetype of international trade situations between countries whose differences in production costs of different sectors are equal. To show it, let's take the example of table 2. In this case, it is impossible to determine the structure of international trade as shown earlier, based on the principle of comparative advantage. However, two possibilities exist then to explain the existence of trade between countries A and B.

First, we can appeal to the costs of the creation of technologies in production costs. To do this, it is assumed that goods X and Y are really technological goods. In this case, it is possible to find an arrangement order of countries according to their production costs but on appealing the costs of the creation of technologies, namely the Research and Development expenditures. It is then possible to determine the structure of the international trade between countries A and B without falling into the deadlock situation of comparison of production costs. Although one of the countries may have an absolute advantage in the production of the two goods, among both countries, the country that will have a higher level of expenditures for research and development for the considered good will have the comparative advantage for that good. That is what the neotechnological theories are doing. The difference in the levels of expenditures on Research and Development is a basis of comparison that explains the order of innovation advent, the direction of movement of the products, and the sliding order of the direction of movement of the products. However, these solutions may be also limited if it is assumed that the expenditures in Research and Development are at the same level in countries A and B. In sum, the differences in productivities of the different productive sectors between countries may be different if the differences of direct productivities exist. For that, it is enough to take into account the productivities connected to the creation of the production technologies.

Second, suppose that the differences in production costs of countries A and B are equal and that the level of their expenditures on Research and Development is the same, the deadlock situation is back, except to use other features of both economies. The primacy in the creation of goods becomes, in this case, a basis for comparison, insofar as it gives a consequent advantage to the leading countries; this situation results in the theory of the products' life cycle that allows to break the deadlock of the impossibility to initial classification. However, this way is closed at the moment where the proportionality of the differences of production costs become equal to the unit; in other words, if countries A and B are identical or have similar characteristics, this will be the case if $k_1 = k_2 = 1$. This latter case is analyzed in the following subsection.

Second case: suppose that $m_1 = m_2$ with $m_1, m_2 \in \mathbb{R}^+ - \{0, 1\}$. We can consider that the human capital theories have been developed to overcome the deadlock posed by the situation in which the differences in productivity of sectors as well as the differences in endowments between countries are equal. These theories in accounting for the staffing of a country in the capital are no more limited to physical capital but take also into account the human capital created by education and formation. The least that one can say is that it is about the ad hoc hypothesis insofar as this kind of capital is not an asset with the birth of a nation. Taking human capital into account can in fact temporarily break the assumption of equality between the differences in the initial endowments of countries in terms of labor and capital. However, this equality break between the differences in endowment can only be momentary. Indeed, nothing excludes to conceive two countries whose differences in endowments in labor (physic), capital (physik), and human capital are perfectly equal. In this configuration, we fall back into the situation of the impossibility to compare the advantages of these two countries on the basis of the characteristics of their production structure. Such a case will be possible if $m_1 = m_2 = 1$. This last case is analyzed in the following subsection.

The least that one can say is that it is about ad hoc assumption insofar as this kind of capital is not an asset with the birth of a country.

5.2. Complementarity with the Theories of Imperfect Competition

Let us notice that all previous theories do not take into account the characteristics of the application if they do not assume the existence of a difference in the countries' requests. They also assume the perfection of competition within each country. The imperfect competition models simply explore the possibilities of international trade when $k_1 = k_2 = 1$ and $m_1 = m_2 = 1$. Two broad guidelines are implemented in this trend to circumvent the impossibility to apply the criterion of the compared costs: differences in the characteristics of the countries' requests and the imperfection of domestic markets.

First possibility, suppose that not only the production costs are identical but also the expenses on Research and Development. Furthermore, it will be assumed that technology transfers are not necessarily a reality. In those circumstances, neither the principle of comparative advantage based on compared costs nor the comparison of expenses level on Research and Development cannot constitute a basis of comparison. The determination of the structure of international trade can be based then only on the characteristics of the national application of the goods. That is what Linder (1961) did with its theory of the representative domestic demand as well as Lassudrie-Duchêne (1971) with the concept of application of the difference.

Second possibility, if we assumed that countries A and B have exactly the same characteristics (same production function, application, the same level of spending on research and development, and absolutely identical goods), then the differences of demand functions are no longer a basis for comparison from which classification is possible. Under these conditions, the criterion for an order of classification (arrangement) can only come from the markets' structure because it is assumed to exist no possible source of differences in the characteristics of the individual components of the market (demand and offer). This is what is done by the application of imperfect competition models in the analysis of international trade (Helpman and Krugman, 1985; Krugman, 1979, 1980, and 1995; Brander et al., 1981; Brander and Krugman, 1983).

6. CONCLUSION

In this document, we have attempted to analyze the trade war between the USA and China from the old debate on the relevance of the principle of free trade in the world trade. To do this, we have tried to show that the explanations of the new theories of international trade based on Research and Development expenses, the differences of technologies, the life cycle of products, the request of difference, the representative domestic demand, and the characteristics of the markets structure complement the principle of comparative advantage in specific cases where the criterion of the latter is not applicable.

To show it, we relied on the general characteristics of the production such as that recorded in the different models. The new theories of international trade then appear as situations in which production characteristics such as that formalized in the Ricardian and Heckscher–Ohlin–Samuelson models are not valid. As well as the criteria for the application of the costs compared even if these are rather implicit.

The main contribution of this work is located at two levels that are alternatively depending on the interpretation that is demonstrated earlier. In a minimalist version, the main contribution of this work is to show that each situation described in this page exists in the reality of international trade. Therefore, just a single criterion of comparison cannot allow to explain the existence or to predict the direction for all possible cases. In other words, international trade does not happen only between different countries with different goods produced by different technologies. The reality of international trade is also made up of exchanges that take place between different countries with different technologies, with countries with perfectly identical characteristics, and with countries admittedly different but differences in production costs are equal. In brief, the different international trade theories do not exclude each other but fit together to form a coherent whole. The development of research on the effects of the market imperfections on nature and the structures of international trade do not remove the luck of Heckscher and Ohlin as feared by Wood (1994b) but are rather to illuminate the dark areas that their theory does not allow to understand. Similarly, it is not a synthesis question as seems to assert Fontagné et al. (1988). The new international trade theories do not make the bed to the mercantilist theories insofar the cases handled by the new international trade theories cannot be subject to the application of the criterion of the principle of comparative advantage. It is therefore not a questioning of the principle of comparative advantage but a complement to the level of the exceptions.

In a further interpretation of the results of our analysis, it should be understood that there is only one criterion of comparison: the principle of comparative advantage. In this context, we would be able to understand the following: (1) the principle of comparative advantage is independent of the criterion of comparative costs and (2) all international trade theories developed after Ricardo endeavor to find the criterion of comparison of countries that could help to determine the nature and the direction of international trade. In this perspective, then it lacks the economic analysis of international trade by a definition of comparative advantage, regardless of the criterion of comparative costs and the links showing how the contribution of the new international trade theories are an application of the principle of comparative advantage.

In sum, there can be no economic justification for a trade war including the one the United States and China are waging.

In the light of the reflections carried out earlier, one should look for the explanations of the logic of trade policies warriors from the Trump administration to the side of the international political economics. In this perspective, international trade is no longer necessarily a positive-sum game.

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Conflict of Interest

None.

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