Tariff liberalization and the growth of world trade: a comparative historical analysis for the evaluation of the multilateral trading system

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May 2009

Abstract

The aim of this study is to assess the relationship between tariff barriers and world trade growth from a comparative and historical perspective and at the same time derive some useful indications for the evaluation of the effectiveness of the current multilateral trading system in promoting world trade. The distinguishing feature of this work is the complex reconstruction of the historical series for the period 1870-2000 on the tariffs and trade of 23 countries thus constituting a good proxy of world trade for the period considered (accounting for over 60 per cent). The study of the relationship between tariff liberalization and trade growth was made through an empirical analysis using panel data and time series. The empirical results, whilst confirming the existence of a long-term relationship at world level between tariff reductions and trade growth, demonstrate how this substantial and significant relationship in the period prior to World War II gradually lost importance and significance from 1950 onwards. This result does not controvert the role that the GATT/WTO system has played in trade liberalization, but would confirm the arguments of those sustaining the importance of the presence of a formalized multilateral trading system, not so much in tariff liberalization but in building a virtuous process of international coordination of trade policies and to ensure a fairer and fuller participation in world trade.

*"the causes which determine the economic progress of nations belong to
the study of international trade"*
(A. Marshall , *Principles of Economics*, 1890)

1. Introduction

Recently, Andrew Rose (2004a) questioned the ability of the GATT system (General Agreement on Tariffs and Trade)/WTO (World Trade Organization) to promote the liberalization of trade policies and stimulate world trade, placing at the centre of the analysis the WTO's reason for being. Although Rose's criticism is based on a wide and detailed empirical analysis, it is mainly limited by the exclusive consideration of the GATT/WTO's operative years, without proposing any comparative analysis and without adequately distinguishing the ways in which an *institutionalized* system works in promoting world trade compared to an *informal* system.

Rose's contribution had, however, the undoubted merit of placing the role and contribution of the WTO at the centre of economic and political debate, producing a destructive effect and stimulating a lively confrontation amongst scholars on the effects of an institutionalized system on world trade (Subramanian and Wei 2007, Tomz et al., 2007).

This study was born from the stimulation offered by this debate. This work aims specifically to answer the following key questions: has tariff liberalization accelerated the growth of world exports? And, if so, has the GATT/WTO produced significant results in terms of trade liberalization and growth in trade with respect to previous periods characterized by a "non structured/institutionalized" regime or even in the absence of a "regime"? It proposes two objectives in order to make a contribution to the current debate on this theme: (a) to verify if there is a defined and stable relationship over time between the reduction of tariff barriers and the growth of trade at world level, comparing the different eras characterized by different trade regimes (b) to assess the effectiveness of the current multilateral trading system in promoting the liberalization of trade policies and to stimulate world trade in the long-term.

The proposed study covers more than a century of trade history and, in particular, three periods in which respectively, trade liberalization on a bilateral basis, the restoration and non-restoration of tariff protections, and the liberalization on a multilateral level dominated. The analysis intends to overcome some of the criticalities of Rose's work indicated above and to accomplish a better evaluation of the GATT/WTO multilateral system by comparing it with the previous system. This analysis is, in fact, consistent with the approach stating that a correct test to verify the success of the GATT/WTO would have been precisely to compare the expansion of trade in the historical periods in which the *clubs* with liberalization mandates were born with those periods when the clubs did not exist (Hufbauer, 2002).

This study, after recalling key stylized facts relating to the relationship between international trade and tariffs, both on an aggregate level and on the level of individual countries, proposes a long-term empirical analysis of the relationship between tariff liberalization and trade growth. The analysis was performed both on an aggregate level for the period 1871 to 1986, through the historical reconstruction of trade data referring to the representative group of world trade countries, and on a panel level for the period 1961-2000. In the latter case, an evaluation of the relationship distinguishing industrialized countries from developing countries was also provided in order to take into account the potential impact of any structural differences among countries in the relationship between tariff liberalization and trade performance.

The distinguishing feature of this work is the complex reconstruction of the historical data relating to tariffs and trade for the 23 countries subject to the analysis[1], a reconstruction that took place mainly through researching printed documentation and data banks on an individual country level. In this light, the study is the first systematic effort, thus far unattempted, to extend this type of analysis to a very long historical period, for which the standard data that is available today cannot be used. Secondly, the value of this work is in proposing an assessment of the effectiveness of the current multilateral trading system through a quantitative comparative analysis with the previous system. Existing work on this issue is, in fact, generally concentrated on short periods of time, with the consequence of not favoring a comparison between different trade schemes and not achieving an overall view of the said relationship.

The results obtained from the empirical analysis allow providing a contribution to the current debate on the liberalization-trade growth analysis, deriving at the same time, a first assessment of the effectiveness of the GATT/WTO in promoting liberalization and trade growth with respect to the previous trading system. In parallel, these results propose providing a reflective contribution on the existence of significant effects in terms of trade liberalization beyond the mere tariff liberalization, which in the final analysis can be exclusively traced back to the presence of an institutionalized system. In substance, the intention is to verify the effectiveness of the GATT/WTO system not only in terms of tariff liberalization but also through the benefits that an institutionalized system brings to world trade in terms of the certainty of the rules and greater coordination of the major players' policies. This analysis intends to contribute in this way to the ongoing debate on the future role of the WTO and near future guidelines of multilateral trade policy.

2. The debate on the effectiveness of trade liberalization: theories and empirical evidence

The drive towards trade liberalization and the reduction of protectionism is certainly not a new phenomenon. The debate on the effectiveness of the trade liberalization policy has animated confrontations between economists since preceding centuries. The affirmation and dissemination of the free trade doctrine took place in the 19th century within the European area. Smith's trade defense in the previous century and the position taken by Ricardo in the debate on *Corn Laws,* in fact produced concrete effects on the future trade policies of European countries at that time. In particular, the 1860 Cobden-Chevalier Treaty, with the introduction of the "most favored nation" clause, played a key role in trade history in the second half of the XIX century (Bairoch, 1976, 1989). Following this agreement, between 1863 and the 1866, most European countries, through Treaties signed with France or the United Kingdom, became part of a dense network of spontaneous and informal free trade agreements, which was renamed "the network of Cobden-Chevalier Treaties". This guaranteed the development of free trade between the era's main commercial powers for around 20 years. The subsequent economic depression and the profound economic and social consequences arising from World War I opened the way to the return of protectionism.

From a theoretical standpoint, the traditional and modern schemes of trade policy theory substantially agreed on the fact that tariffs produce distortive effects on the economic system that introduces them, leading to a suboptimal allocation of resources. Such distorting effects, moreover, are more significant the more the country that introduces them is assimilable to the hypothesis of a "small country", i.e. not able to influence the actions of competitors with its trade policy. To the contrary, tariff liberalization, in producing changes to relative prices that determine the shift of resources from the import-substitution goods sectors to exported goods sectors, led

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[1] The countries analyzed are: Argentina, Australia, Brazil, Canada, Chile, Colombia, Denmark, the Philippines, France, Germany, Japan, India, Italy, Mexico, Norway, New Zealand, Peru, Portugal, United Kingdom, Spain, Sweden, Turkey, USA.

to a better allocation of resources and, in this way, increased production, consumption and the welfare of partner countries. The trade policy theory, despite the recognition of the existence of valid justifications for the introduction of foreign trade restrictions, as in the classic case of "infant industry", or the so-called "second best" approach, according to which it would not be optimal to refrain from trade policy interventions in the presence of domestic market failures, highlights how resorting to protectionism nevertheless always produces implementation limitations and difficulties. The country that intends to resort to such restrictive import policies must hope, in the first place, as suggested by the "optimal tariff' theory, that foreign countries who feel impaired in their export capacity do not in turn make use of retaliatory measures for the containment of exports from the protectionist country. If this were to happen, it would put in motion a trade war capable of damaging all competitors. Only by exiting from economic theory and expanding the analysis to the so-called "political economy of protectionism", can the trade protection measures be considered as the policymaker's rational response to the pressures arising from interest groups.

If attaining, from the theoretical point of view, to the contributions of traditional theory as well as to the new theories, then the effects of tariff liberalization in the economic system appear to now be consolidated. From an empirical standpoint, conversely, the positions are divergent and the relationship between trade policy and trade growth is less clearly defined. Indeed, this represents one of the more controversial issues in economic debate. The analyses carried out from the second half of the 1900s have in fact produced mixed results, at times contentious to that sustained by the theory.

Some of the works confirm the existence of a direct effect of tariff reduction on the growth of trade. Among the more significant contributions to be cited are the pioneering studies carried out by Balassa (1965, 1967), where the effects of import tariffs reduction in industrialized countries and the impact of the industrialized countries tariff on imports of manufactured goods from underdeveloped countries were analyzed, as well as the subsequent developments by Leith and Reuber (1969), which took into consideration the effects of a reduction of tariff barriers of industrialized countries on exports of developing countries.

Through an analysis of individual countries, Krueger (1978) demonstrated that a more liberalized system produces positive effects on exports but imports respond more quickly to liberalization, causing a temporary trade imbalance. More recently, the World Bank (World Bank, 1987) compared the economic performance of developing countries that adopted liberalization programs with those maintaining a high level of protection, highlighting that the former obtained better results. In a similar vein, Thomas, Nash and Edwards (1991) and Ahmed (2000) empirically demonstrated that trade liberalization programs have had a significant impact on the supply function of exports. Bleaney (1999), through a measurement of the effects of trade reforms in Latin America on the growth of trade with the use of a panel model, also obtained positive results. Papageorgoiu, Michaely and Choski (1992), demonstrated with a cross-country analysis how a change in the liberalization system can produce a significant effect on exports. Similar results were obtained by Weiss (1992), Helleiner (1994), Joshi and Little (1996). Leraner (1990), Harrigan (1993) and Trefler's (1993) studies also found significant effects of protective measures on trade flows. Madsen (2001), using a panel model in a study evaluating the effects of a restrictive trade policy on world trade for the period between the two World Wars, found that the contraction of trade flows in that period also had amongst its causes an increase of tariff barriers. Recently Santos-Paulino and Thirwall (2004), using a panel analysis of more than 20 developing countries, estimated the effects of trade liberalization on the various components of trade balance and on the balance of payments, demonstrating that liberalization in the case of developing countries stimulated exports but even more so imports, determining a worsening of the overall trade and payment balances of these countries.

Opposing results were those obtained in studies conducted by Baldwin and Lewis (1978), Cline et al. (1978), Ray (1981) and Bhagwati (1988), which showed little impact of trade liberalization on

imports. In a well-known study on this theme, Ostry and Rose (1992) also demonstrated, through recourse to different theoretical models, that a change of tariff rates produces insignificant effects on main macroeconomic variables, trade balance included. The UNCTAD (1989) study produced similar results, presenting a panel data estimate on the impact of liberalization on the trade balance for some industrialized and developing countries, demonstrating that which had a positive effect on the trade balance of developing countries was not trade liberalization in itself but more favorable terms of trade and more sustained growth in industrialized countries. The work of Agosín (1991), Clarke and Kirkpatrick (1992), Greenaway and Sapsford (1994), Shafaeddin (1994) and Jenkins (1996) also found little evidence in support of the relationship between trade liberalization and growth of exports. Lastly, Nenci and Pietrobelli (2008), through an empirical analysis estimating the effect of trade liberalization on import performance of selected Latin American countries covering the whole XX century, showed as a long run relationship between tariff reduction and import growth exists, but only from the second half of the XX century when integrated within a wider process, implying a multilateral and negotiated approach to trade policy.

The debate becomes even more heated when attempting to directly or indirectly associate such an analysis to the evaluation of the effectiveness of the current multilateral trading system. The position taken by some trade policy scholars is to interpret the increase of world trade in the second half of the 20th century as the result of the reduction of barriers deriving from the multilateral trading regime following World War II. The pillars of this regime, on which the policy for the promotion of world trade was based, were founded first on GATT and then on WTO, linked mainly to the substantial reduction of customs duties and other protectionist measures. The position taken by these scholars often implies the assumption of the superiority of this trade regime with respect to the "informal" pre-GATT system, characterized by its network of bilateral trade agreements that began with the 1860 *Cobeden-Chevalier Treaty*, including the most favored nation rule.

To the contrary, a second group of scholars considers the role played by the GATT/WTO system as non-determinant in promoting world trade through trade liberalization, arguing that the *formalization* of the system, through the signing of multilateral agreements, did not produce the expected results nor led to substantially different results than those already produced by the previous trading system. In this respect, the empirical contributions of Rose (2004a, 2004b, 2005) need also be mentioned, which inspired this current study, based on a gravitational model estimated for more than 170 countries, through which the work of the GATT/WTO was evaluated in terms of liberalization and promotion of world trade. The results of these analyses have had a destructive effect in the economic and political debate linked to the role and contribution of the WTO, stimulating a heated debate amongst experts.

Some have criticized Rose by challenging the quality of the trade flow measurements carried out in his work and claiming that the WTO's mandate is not only trade liberalization, as sustained in the analyses he conducted (Low, 2002). Others (Hufbauer, 2002) have suggested that a correct test to verify the success of the GATT/WTO would be to compare the expansion of trade in the historical periods when the clubs with liberalization mandates were born with the periods in which the clubs did not exist, rather than an analysis limited to the validity period of the current system. In response to Rose's conclusions, Subramanian and Wei (2007), using the same data as Rose and perfecting the econometric model[2], provided robust evidence of the fact that the GATT/WTO has had a significant and positive impact on the trade of member states, although non-uniform due to the asymmetries present within the GATT/WTO system. They demonstrated, in fact, that the growth of trade flows of industrialized countries acceding to GATT/WTO was higher than that registered in developing countries that are also part of the

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[2] The authors remark that the model used by Rose is methodologically incomplete in that it does not take account of the recent results obtained by Anderson and van Wincoop (2003) with the introduction of fixed effects by country within the gravitational equation, nor the asymmetries existing within the GATT/WTO system.

system. Lastly, Tomz *et al.* (2007) showed that Rose, in his analysis, has overlooked a large proportion of countries to which the trade agreement applied and mistakenly classified them as nonparticipants. This caused a downward bias in his estimates of the GATT's effect. They consequently argued that GATT and its successor WTO has had a substantial positive effect on trade.

The debate opened by the latter contributions is the point of departure of the following proposed empirical analysis.

3. Stylized facts

There is widespread agreement that the post World War II period was characterized by a gradual strengthening of international economic interactions, evidenced by the presence of intense and increasing world trade in goods, services and flows of capital. This growing interaction was accompanied by a parallel economic integration at international level, intended as the process of the reduction of barriers that are opposed to the free movement of goods, services and factors (Basevi et al., 2001).

By analyzing the data relating to trade and financial flows in the second half of the last century as a measure of the degree of "economic interaction", the hypothesis of the existence of a high level of economic interaction would seem to be verified. In particular, the data relating to world trade shows sustained growth of trade in that period, exceeding the GDP. Furthermore, from the 1960s to today, industrialized countries have recorded an average increase of 50% in their degree of trade openness (Baldwin and Martin, 1999).

The degree of financial openness, expressed as the absolute value of the flow net of capital in relation to the GDP, has also shown an average increase of around 70% in industrialized countries in the same period, while world foreign direct investments have increased by more than fourteen times commencing from the 1980s (UNCTAD, 2004).

This growing *interaction*, moreover, seems to be effectively accompanied by a parallel economic *integration* at international level. Fig. 3.1., referring to the average trends of tariff barriers in different geographical areas of the post-war period, shows, for example, a common declining trend.

The effective existence of the post-war "interaction-integration" phenomenon and, above all, its extraordinary nature is not, however, an opinion shared amongst scholars. There are those who believe that a similar phenomenon occurred previously and in particular between the end of the 1800s and World War I, divesting the current situations of its singularity (Sachs and Warner, 1995). In other words, the recent escalation of overall economic interaction at international level has had precedents. Baldwin and Martin (1999) stress, in this regard, how economic history has revealed the existence of two globalization waves: the first took place in the period from 1820 to World War I, the second in the period from 1960 to today. In both cases, although in different forms, a significant trade and financial openness and a transformation in the production structure of countries and the relative prices of factors was witnessed.

*Figure 3.1. – Average of regional tariffs after World War II*
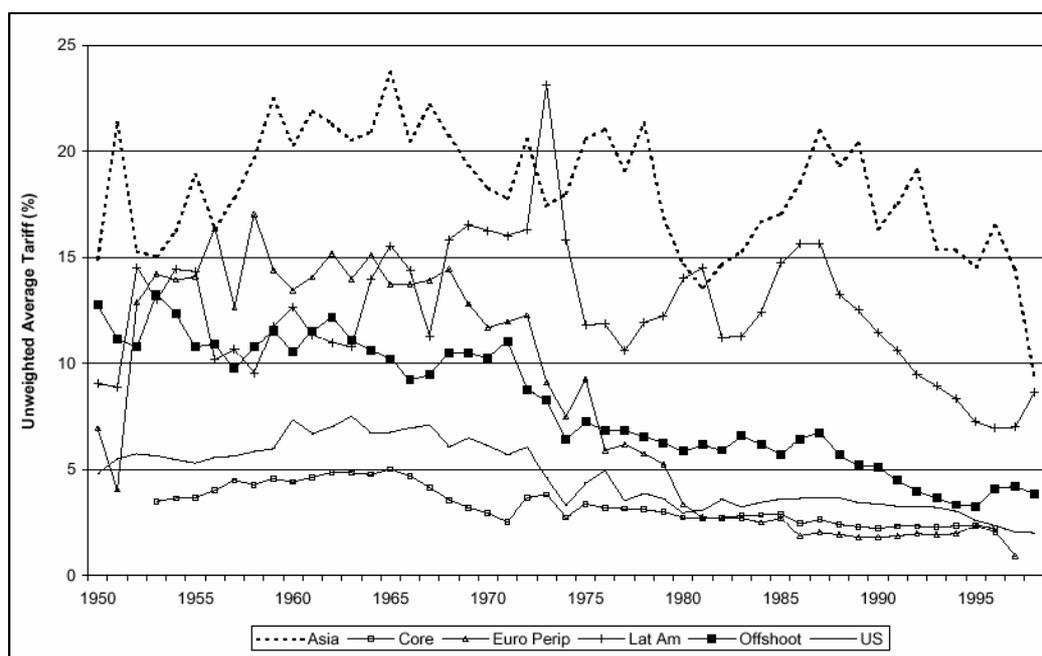
As concerns instead the process of "economic integration", both globalization waves actually coincided with a substantial reduction of natural and artificial barriers. That is to say, a decrease of transport costs and transmission of information costs was witnessed, as well as a reduction of barriers for the trading of goods and factors.

By taking, for example, the data concerning the United States, the trend of average tariffs on imports reveals a decrease starting from the 1934 *Trade Agreements Act* that became even more marked following the birth of GATT and the subsequent multilateral negotiation rounds. By extending the period of observation it is possible to see how the fall of US tariffs, if excluding the period between the two World Wars, was already present at the beginning of the last century, as shown in Fig. 3.2.

In reality, by going back in years up to the second half of the XIX century, it is striking to note that what appeared to be a phenomenon related to a specific trading system was in fact a trend already present in historical periods when the system did not yet exist.

In the case of the United States, the phenomenon would seem to have origins that significantly precede the birth of the GATT. But what can be said at world level?

Figure 3.2. Average tariffs on US imports (1900-2000)
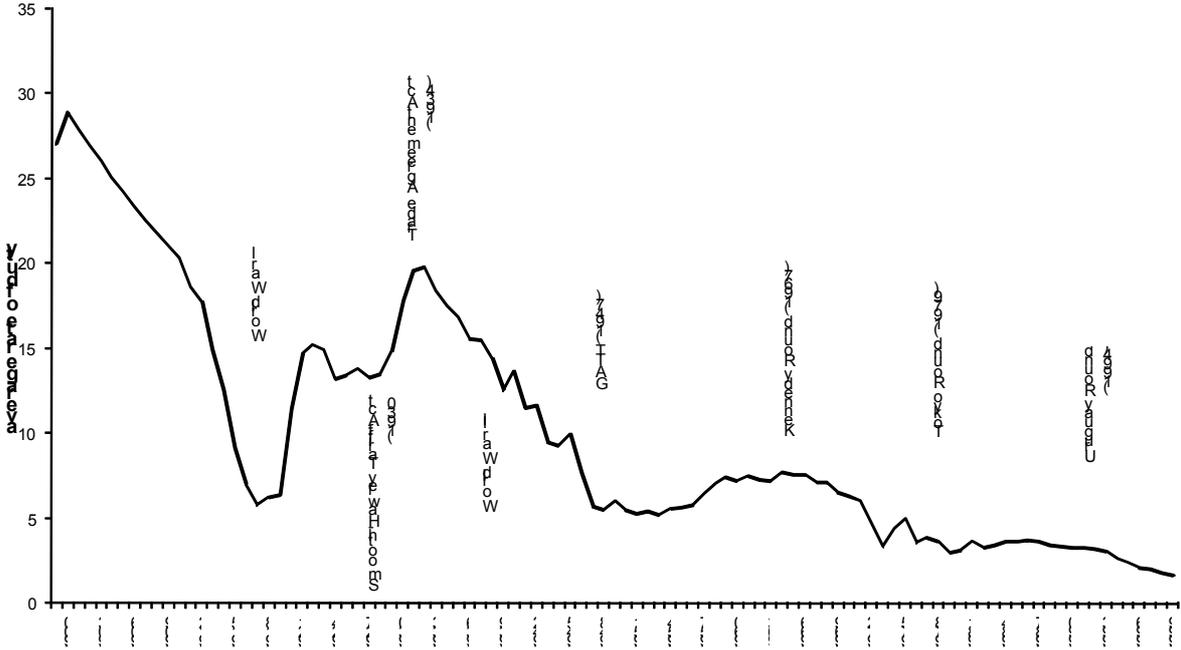
Source: Author's processing from Coatsworth and Williamson (2002) and World Bank (2003)

By analyzing the data relating to the tariffs of the main industrialized countries, which at the end of the last century already represented the main commercial world powers, and aggregating them to obtain a proxy of world data, it is possible to verify the existence of a downward trend of average tariffs, except for the period between the two World Wars (Fig. 3.3), whilst a joint examination of the historical series of tariffs and average world exports clearly highlights the presence of a reverse trend among the two variables (Fig. 3.4.).

Figure 3.3. – Average of world tariffs (1870-2000)
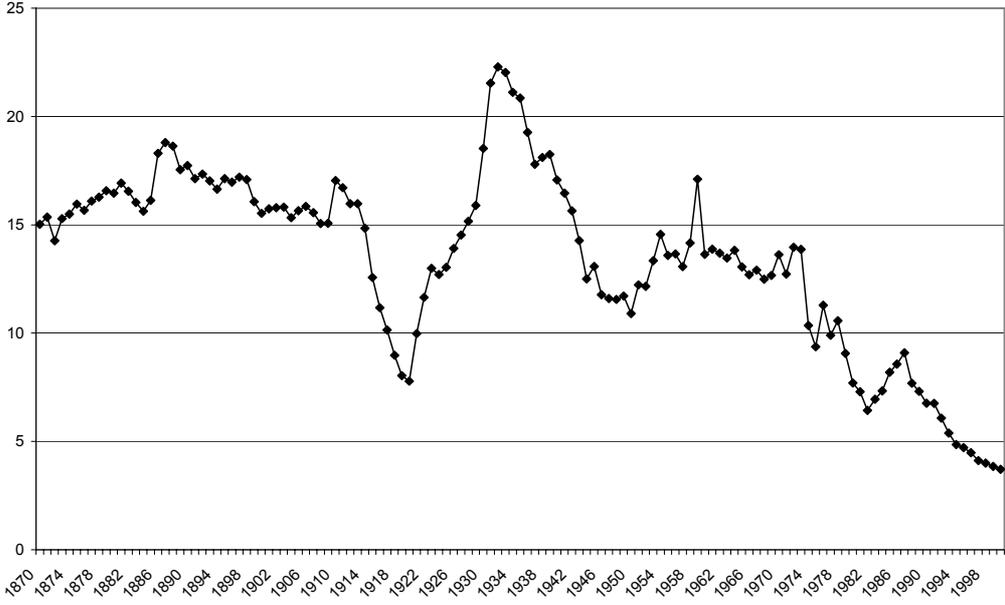
Source: Author's processing from Coatsworth and Williamson (2002) and Mitchell (1992)

Figure 3.4. – World average tariffs and world exports (1870-2000, logs)
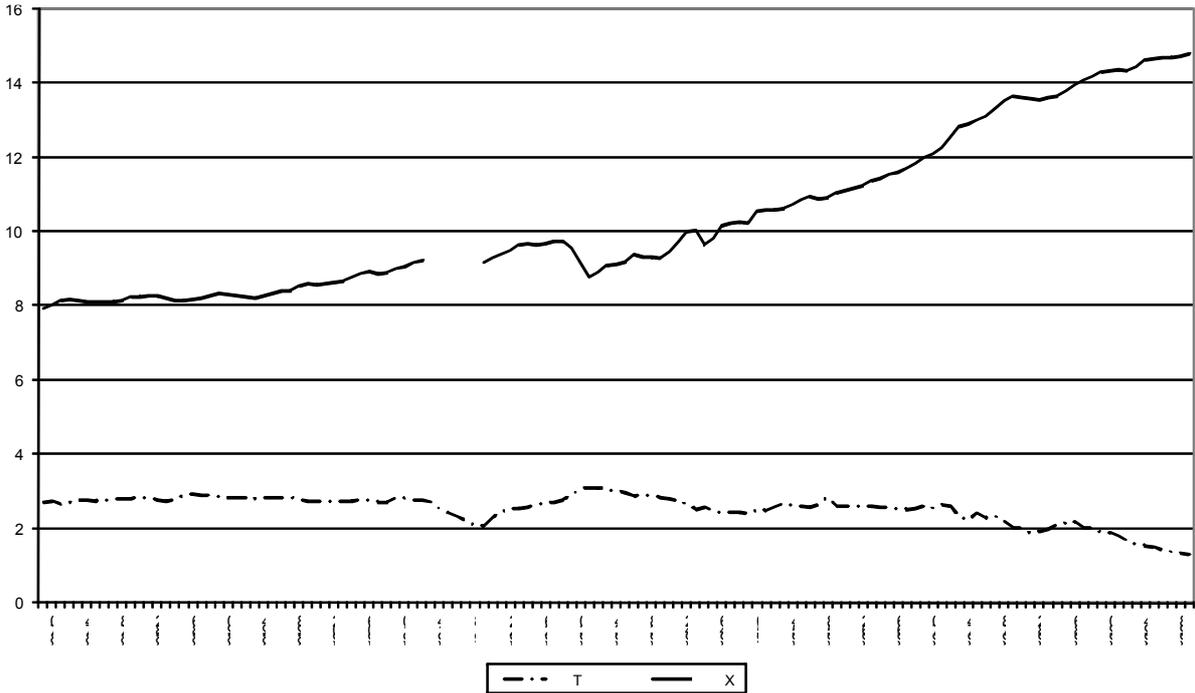
Source: Author's processing from Coatsworth and Williamson (2002), Mitchell (1992) and Maddison (1989)

The existence of a reverse trend is even more evident if analyzing the rate of change of the two variables for the target period. The change in exports, in fact, with rare exceptions, shows a trend that contrasts with that of tariffs (Fig. 3.5.).

Figure 3.5. – Fluctuations of world average tariffs and world exports (1870-1998, logs)

Source:: Author's processing

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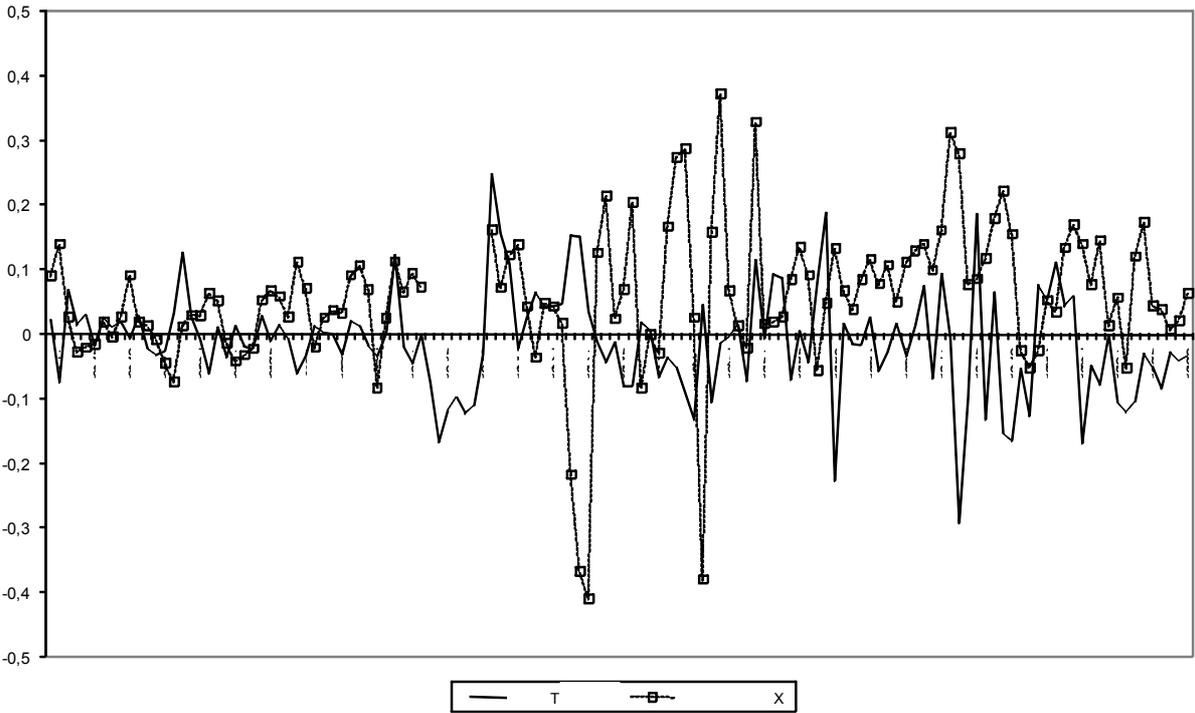
Despite empirical evidence of these phenomena, it would nevertheless be extremely reckless to directly relate, as often happens, the process of *interaction* - greater trade interrelationship - with that of *integration* - reduction of trade barriers – without a further in-depth study or, even, sustaining the possible greater significance of this relation from the post World War II period.

In particular, if a specific aspect of the question is considered, that is, the link between growth of trade and reduction of tariff barriers, then an in-depth analysis is absolutely essential.

4. Trade liberalization and trade growth: an empirical test

This empirical exercise aims to contribute to the debate on the effectiveness of the liberalization policy and on the impact of the multilateral trade integration process to foster trade growth. The empirical test was carried out using different estimation techniques including time series analysis and panel data analysis.

4.1. The aggregate analysis

To estimate the impact of a reduction of tariff barriers on world trade flows, when trade flows are represented by exports, the empirical model used stems from the standard export demand function (Goldstein and Khan, 1985; Senhadji and Montenegro, 1999; Thirlwall, 2003) commonly used in empirical trade literature. The estimation equation has the following linear specification:

$$\ln X_{wt} = \alpha_1 \ln Y_{wt} + \alpha_2 \ln P_{wt} + \alpha_3 \ln T_{wt} + \alpha_4 \ln X_{wt-1} + \upsilon_t \quad [1]$$

where X_w indicates the level of world exports (here intended as a proxy of world trade); Y_w the level of world income; P_w is a measure of relative competitiveness (expressed as the ratio between the price of exports of manufactured goods and the price of exports of primary commodities at time t); T indicates the average world tariff (given by the ratio between customs duties on imports and the value of imports); X_{t-1} the level of world exports at time t-1; and υ is the stochastic error term, while the t index indicates the time. The short-run elasticity of exports with respect to income, prices and tariffs are, respectively: α_1, α_2 e α_3 and the expected signs are: $\alpha_1 > 0$, $\alpha_2 < 0$ e $\alpha_3 < 0$.

The analysis concerns the period 1870-1986 and the values of the variables are the result of a complex reconstruction of the historical series of the main commercial world powers (23 countries overall, see Table 4.1). These countries together cover more than 60% of world trade for the whole period of analysis considered (see Fig. A. 1. in the Appendix) and consequently, the aggregate trade of these countries was considered an adequate proxy of world trade.

In particular, the world exports variable was obtained by aggregating the annual export flows in values by country obtained (US dollars, 1990 constant prices) for the period 1870-1950, from the various official national documents and integrated with the work of Maddison (1989), Hofman (2000) and Mitchell (1998a; 1998b; 1998c) and the *Direction of Trade Statistics* (DOTS) International Monetary Fund data for the period 1951-2000.

The world income variable was obtained by aggregating the annual income values by country (US dollars, constant prices 1990) from the University of Groningen's *Growth and Development Centre* data bank and integrated with the work of Maddison (1982; 1989; 1995; 2001).

The relative world prices variable is represented by the ratio between the index of unit values of manufactured goods exported by a number of industrialized countries and the price index of a representative basket of internationally traded non-fuel primary commodities[3]. These indices derive from the work of Grilli and Yang (1988), and are available for the period 1900-1986.

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[3] The index is weighted (the weights are the values of world exports of all goods relative to the 1977-1979 period).

The world tariff variable was obtained from the average of aggregate annual customs duties by country (calculated as the ratio between the import customs revenue and total imports value). The data relating to tariffs from 1870 to 1950 was drawn from the data bank of the Harvard research group coordinated by Jeffrey Williamson. The data for the period 1950-1970 derives from the work of Mitchell (1998a; 1998b; 1998c) integrated with the official national documents, while data for the period 1970-2000 was drawn from the World Bank - *World Development Indicators* (2002) - data bank. Although this measure may be considered rather rough, it continues to be the most used variable in long-term analyses (see, e.g. Capie, 1994; Vamvakidis, 2002; Clemens and Williamson, 2001; O'Rourke, 2000, 2001). In our specific case, it is also the only historical measure available for the specification of the liberalization process observed.

Table 4.1. – Countries analyzed

Countries	
Argentina	India
Australia	Italy
Brazil	Mexico
Canada	Norway
Chile	New Zeland
Colombia	Peru
Denmark	Portugal
Philippines	United Kingdom
France	Spain
Germany	Sweden
Japan	Turkey
	United States

The complex historical reconstruction of the data is both an advantage and the main limitation of the proposed analysis. In fact, we had to rely on a limited range of available statistical data and, in some cases, take into consideration their uncertain reliability[4]. Another element to consider in this analysis is the fact that in recent years a gradual reduction of tariff barriers and a parallel increase of the use of so-called "non-tariff" barriers have been recorded. As a result of this trend, the average world tariffs of manufactured products fell from an average value equal to around 48% in 1947 (the year of the GATT's signing) to less than 5% today. Therefore, account of this must be taken, in the case in point, when comparing the relationship between tariff and trade liberalization between the different historical periods. Finally, because developing countries' average tariffs are higher with respect to industrialized countries, and very high in absolute terms, there is probably an inverse relationship between the applied level of nominal tariffs and imports, which influences the value indicator used here to measure the tariff barriers. This indicator, in fact, in the case of developing countries, could be distorted downwards and lead to incorrect interpretations on the relation between tariff barriers and import flows in those countries[5]. This

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[4] Naturally, all comparative tests, especially when the period of time is particularly long, have methodological issues of reliability, consistency and comparability of the data series. Reliability of data depends in large measure on the quality of sources but also on the quality of the methods of adjustment, which may not always be guaranteed. This is particularly true for the data prior to the second half of the last century. As a result, with respect to the efforts to ensure proper data collection, the historical series may not always be consistent or comparable and there is always the risk, especially in long-term comparisons, of obtaining misleading results. For the historical comparison of countries of the period prior to the international publications of the United Nations and International Monetary Fund, thanks to which the standardization of collection systems and the dissemination of data was realized, it is still reasonable to assume that the margin of difference in the figures from original sources is more or less comparable for each country, so that these statistics may be considered acceptable, even if imperfect, indicators.

[5] A prohibitive tariff, for example, could be interpreted as a rate equal to zero and alter the relationship between the level of tariffs and the level of trade flows.

problem is certainly present but is not considered important enough to significantly affect the analysis on an aggregate level.

4.1.1. The estimated model

Prior to estimating the model, the stationarity of export, income, price and tariff time series was tested using the ADF – Augmented Dickey-Fuller (Dickey and Fuller, 1979) and PP-Phillips and Perron (Phillips and Perron, 1988) unit root tests. As both the tests showed a very high probability of the existence of a unit root in all series, and therefore nonstationarity in levels, first differences of the variables were considered[6] (Hamilton, 1994).

In this way, the estimated model thus becomes:

$$x_{wt} = a_1 y_{wt} + a_2 p_{wt} + a_3 t_{wt} + \alpha_4 x_{wt-1} + \mu_t \qquad [2]$$

where x_w is the rate of change of world exports, y_w is the growth of world income, p_w is the rate of change of relative prices, t_w is the rate of change of average world tariffs, x_{wt-1} is the rate of change of world exports at time $_{t-1}$, and μ is a stochastic error term.

As this concerns a very long-run relation, it was also tested for the existence of a structural change in the model. Not surprisingly, the stability tests indicated a high probability of a structural change in the model in the early 1950s (see Table A.1 in the Appendix) and consequently, the model was subdivided into two sub-periods: 1870-1939[7] and 1951-1986.

Given the presence of the series I(1), the existence of a possible cointegrated relationship[8] between the dependant variable (exports) and the regressors for the two sub-periods considered was also investigated.

To inquire into the existence of a possible cointegrating relationship between the dependent variable and the regressors, the ARDL - Autoregressive Distributed Lag – approach (Pesaran and Pesaran, 1997; Pesaran and Shin, 1999) was used. The existence of a long-run relationship was examined by calculating an F-statistic. The F-statistic was used to examine the significance of the lagged levels of the variables in the error correction form of the underlying ARDL model. The calculated F-statistic was compared with the critical value tabulated by Pesaran and Pesaran (1997).

The presence of a cointegrating relationship between the dependent variable and regressors was revealed exclusively for the 1951-1986 period[9]. Once the existence of cointegration was verified for the 1951-1986 period only, the estimate of the long-run coefficients and the error correction model for this period was carried out, while the model was estimated in differences for the 1870-

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[6] The same tests confirmed the first differences were stationary, concluding that the variables are integrated of order 1.

[7] The analysis did not include the years relating to World War II and those immediately following, in order to avoid possible distortions.

[8] It is common knowledge that the differencing procedure produces the loss of valuable long-run information in the data. If the existence of a cointegrating relationship is proved, using a first difference model is not a correct strategy since it would ignore a movement source of variables (Hamilton, 1994). The theory of cointegration addresses this issue by introducing an error-correction (EC) term. The EC term lagged one period (ECt-1) integrates short-run dynamics in the long-run function (Engle and Granger, 1987). The ECM specification permits to extract from the data the whole information available without infringing, *a priori*, the classical hypotheses. Furthermore, if the equilibrium relation has been correctly specified, then the long-run deviation series will also be stationary (Engle and Granger, 1987).

[9] The F-statistic for this sub-period takes a value of 6,43. Comparing this value with the interval of critical values - (from 5,02 to 6,01) under the assumption of no intercept and no trend - the null hypothesis of no long-run relationship between the variables at the 1 per cent significance level was rejected.

1939 period. The estimate of the model in differences for the period 1871-1939 was effected using the OLS method. In order to highlight the effect of trade liberalization measures on the relation, consistent with the objectives of the analysis and in line with recent empirical work on this subject (Rose, 2004a, 2004b; 2005; Santos-Paulino and Thirlwall, 2004; Pacheco-Lopez, 2005), the model was also modified by introducing some dummy variables.

In particular, a dummy was considered to assess the effects on world trade of the network of bilateral treaties subsequent to the 1860 Cobden-Chevalier Treaty (*dCC*). This variable intended to highlight the existence of a "further" liberalization effect compared to that specifically linked to the reduction of tariff barriers, already captured by the relative coefficient[10].

Moreover, a specific dummy was also considered to take account of the possible effects of the 1929 (*d1929*) world economic crisis on the model.

The resulting estimated model thus becomes:

$$x_{wt} = a_1 y_{wt} + a_2 p_{wt} + a_3 t_{wt} + a_4 x_{wt-1} + a_5 dCC_{wt} + a_6 d1929 + \mu_t \quad [3]$$

where *dCC* and *d1929* represent binary dummies (taking the value of 1 when the event is present and 0 otherwise).

The estimate for the period 1951-1986[11] was carried out with the error correction model[12]. The ECM is the most common method of analysis when needing to take into consideration not only the short-run dynamics among the variables but also the long-run economic relationship. Formally, an explaination of the variations of the dependent variable was attempted, not only in function of variations of the explanatory variables, but also the delayed deviation of the theoretic relation.

The specification of the general error correction model (ECM) takes the following form:

$$x_{wt} = \sum_{i=1}^{n} a_{1i} y_{wt-i} + \sum_{i=1}^{n} a_{2i} p_{wt-i} + \sum_{i=1}^{n} a_{3i} t_{wt-i} + \sum_{i=1}^{n} a_{4i} x_{wt-i} + a_5 EC_{t-1} + a_6 dround_t + \mu_t \quad [4]$$

$$\text{where:} \quad EC_{t-1} = \delta_1 \ln X_{wt-1} + \delta_2 \ln Y_{wt-1} + \delta_3 \ln P_{wt-1} + \delta_4 \ln T_{wt-1}$$

Furthermore, specific dummies were considered in the model to take account, as in the previous period in the case of the post-*Cobden-Chevalier Treaty* agreements network, of any subsequent effects of liberalization with respect to the mere tariff liberalization resulting form the various negotiating rounds within the GATT.[13] In particular, the following dummies were considered: *dROUND1* to disclose liberalization effects linked to the Torquay (1951) and Geneva (1956) negotiations; *dROUND2* for the liberalization effects linked to the Dillon Round (1960-62) and the Kennedy Round (1962-67); *dROUND3* for the liberalization effects of the Tokyo Round (1973-79) [14].

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[10] A typical effect of this type is, for example, the formation of a more favorable international climate for trade.

[11] The estimates relating to this period are the aggregate values of all 23 countries.

[12] The estimates were made using the Microfit econometric program. In the analysis carried out, a single delay of the explanatory variables was chosen, while the structure of the delays of the ARDL specification of the short-run dynamic was determined using the Schwarz Bayesian Criterion (SBC).

[13] It was decided to indicate the most significant Rounds (in terms of tariff cuts and participation) with a single dummy, while the least important were grouped together. The dummies combining several Rounds assume value 1 at the start of the year following the end of the last round.

[14] The 1986-1994 Uruguay Round was not taken into consideration due to lack of observations.

4.1.2. Outcome of the aggregate analysis

As regards the analysis relating to the period prior to World War II, 1871-1939, this was based on aggregate data from nine industrialized countries (Canada, Denmark, France, Germany, Italy, Norway, Sweden, United States and United Kingdom)[15]. The relation presents robust and significant parameter values and the coefficients signs are those expected (Table 4.2). In particular, the theoretical hypothesis of a direct relationship between the growth rate of exports (as a proxy of the growth of world trade) and the annual growth rate of world income and the inverse relationship between the growth rate of exports and the change in tariffs at world level were confirmed. Instead, the hypothesis of a significant effect of trade liberalization linked to the presence of the post-*Cobden-Chevalier Treaty* agreements network, beyond the mere effect of tariff reduction, was not confirmed, likewise the hypothesis of a specific effect on the model linked to the '29 crisis. Despite the fact that it is clear from the statistical data that, in the years immediately following the crisis, there were surges in the protection levels and a consequent drastic reduction in international trade flows, this dynamic remains perfectly consistent with the basic characteristics of the estimated model, without determining any structural changes. In particular, all the estimates indicate an important relation between the change in tariffs and the change in trade: in all cases, to a change in tariffs an almost proportional change in trade corresponds. This elevated elasticity of exports to changing tariffs which, as will be demonstrated further on, is not confirmed by the analysis relative to the post-World War II period, could in part be justified by a higher average level of tariffs in the period considered (roughly around 30%). Such a high level of tariff barriers in fact renders the trade policy particularly effective in determining international trade flows.

Since data relating to the price variables are only available from 1900, a further version of the model was estimated (Table 4.2, model 4) for the period from 1901 to 1939 with the aggregate values of a group of 14 countries, constituted by the previous nine plus five Latin American countries (Argentina, Brazil, Chile, Colombia, Mexico and Peru). The estimate referring to the 1901-39 period, although including a smaller number of observations, confirms the above results while the introduction of the relative prices variable, which contribute to specifying the model more appropriately, was revealed as robust and significant. In particular, as regards the price variable coefficient, this presents a negative sign, highlighting an inverse relationship between price variations of manufactured goods compared to primary commodities and changes in trade flows.

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[15] The statistical data relating to the other countries of the sample are only available from 1930 onwards.

Table 4.2

OLS   1871-1939

Explanatory variables	Dependent variable: EXPORT GROWTH[1] $[x_w]$			
	1	2	3	4[3]
Lagged export growth $[x_{wt-1}]$	0,2526	0,2547	0,2491	0,2824
	(2.41)*	*(2.41)**	*(2.37)**	*(4.56)****
World income growth[2] $[y_w]$	0,2617	0,2707	0,2511	1,0891
	(2.24)*	*(2.24)**	*(2.13)**	*(3.80)****
Tariff change $[t_w]$	-0,9728	-0,9469	-0,9851	-0,8114
	(6.68)***	*(5.69)****	*(6.70)****	*(3.07)****
International price change $[p_W]$				-0,4274
				(2.71)***
1929 Crisis Dummy [d1929]		0,0101		
		(0.33)		
Cobden-Chevalier Net Treaties Dummy [dCC]			0,0181	
			(0.78)	
F-test	[0.0000]	[0.0000]	[0.0000]	[0.0000]
Breusch-Godfrey Test (Prob.>chi2)	[0.3111]	[0.2854]	[0.3385]	[0.5315]
Akaike info criterion	-2,5702	-2,5376	-2,5470	-1,8998
Schwarz criterion	-2,4281	-2,3599	-2,3694	-1,6619
No. of observations	58	58	58	30

Notes:

Figures in parenthesis ( ) are absolute t-ratios; figures in brackets [ ] are p-values. * indicates that a coefficient is significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level.

[1] Exports of the nine main world export countries

[2] Sum of income values of 29 countries (about 70% of world income for the period considered)

[3] The empirical test relates to the 1901-1939 period and the value of the variables relates to 14 countries.

As concerns the estimates for the 1951-1986 period, the ECM coefficients are reported in Table 4.3[16].

With regards to the ECM (Table 4.3), the theoretical hypothesis of a direct relationship between the growth rate of exports (as a proxy of the growth of world trade) and the world income annual growth rate remains confirmed, while the relation between the rate of change of exports and the rate of change of tariffs is hardly significant. This confirms, in addition, the inverse relationship between the change of trade flows and the price changes of manufactured goods compared to primary goods. The greater significance of the EC term attests to the validity of the long-run equilibrium relation. The not particularly high value of the EC term indicates, however, that adjustment of the model to the long-run equilibrium values comes about slowly.

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[16] The long-run coefficients with the ARDL procedure (1,1,0,1) was also estimated using the Microfit econometric program.

Table 4.3

ECM derived from the ARDL approach   1951-1986

Explanatory variables	Dependent variable: EXPORT GROWTH[1] [x_w]				
	1	2	3	4	5
World income growth[2] [y_w]	3,0378	3,3009	3,3063	3,1019	3,2905
	(3.43)***	(3.91)***	(3.85)***	(3.80)***	(3.82)***
Relative price change [p_w]	-0,3998	-0,3344	-0,3396	-0,3067	-0,3296
	(4.12)***	(3.68)***	(3.50)***	(3.47)***	(3.39)***
Tariff change [t_w]		-0,0168	-0,7369	-0,0497	-0,0076
		(0.01)	(0.00)	(0.37)	(0.05)
EC (-1)	0,0513	0,1450	0,1413	0,2970	0,1421
	(2.95)***	(3.61)***	(2.98)***	(1.74)*	(3.15)***
Annency-Torquay-Geneva Round Dummy [dR_1]			0,0570		
			(0.15)		
Dillon-Kennedy Round Dummy [dR_2]				0,0722	
				(1.90)*	
Tokyo Round Dummy [dR_3]					0,0088
					(0.15)
F-test	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]
Akaike info criterion	44,4090	47,9520	46,9665	49,0642	46,9669
Schwarz criterion	41,2420	43,2014	41,4242	43,5219	41,4245
No. of observations	37	37	37	37	37

Notes:

Figures in parenthesis ( ) are absolute t-ratios; figures in brackets [ ] are p-values. * indicates that a coefficient is significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level.

[1] Exports of the 23 main world export countries

[2] Sum of income values of 29 countries (about 70% of world income for the period considered)

Finally, the estimates, consistent with the findings of the dummy variable referring to the *Cobden-Chevalier Treaty* for the 1871-1939 period, underline the scarce significance, also within GATT, of the dummy referring to the various negotiation Rounds. Also in this case, the multilateral trade agreements do not seem to have determined further effects on the process of trade liberalization with respect to those referring to the mere reduction of tariff barriers. With the aggravation, as regards specifically the post-World War II period, that the effect of tariff barrier changes on world trade flow changes is much less significant than in the previous period, although confirmed from the long-run equilibrium point of view.

In conclusion, if on the one hand the estimates confirm the existence of a long-run relationship between tariffs and trade, then on the other they demonstrate how such a relation diminishes in importance and meaning in the course of time, probably in function of the loss of importance of tariff barriers in the context of trade policy at international level and the parallel emergence of so-called non-tariff barriers.

4.2.   Panel data analysis

A further analysis was made passing from the aggregate relation to the panel analysis. In fact, the panel data present a series of advantages that enrich the overall empirical analysis[17].

In order to maintain a symmetrical relationship with the foregoing analysis, the panel was built with the data of the same 23 countries that were considered in constructing the historical series at the aggregate level. However, the estimate relation used in the regression panel is different from the previous. Whereas in the aggregate analysis the objective was to measure the impact of average world tariffs on world trade on an aggregate level and, therefore, the choice of considering the export or import flows as dependant variables was substantially indifferent, in the panel model the objective was specifically to provide additional information on the impact of tariff liberalization on the import flows of the countries considered.

The empirical specification stems from the standard import demand function commonly used in the empirical trade literature (Leamer and Stern, 1970; Goldstein and Khan, 1985; Thirlwall, 2003). The basic estimating equation takes the following form:

$$\ln M_t = \beta_0 + \beta_1 \ln Y_t + \beta_2 \ln P_t + \beta_3 \ln T_t + \beta_4 \ln M_{t-1} + \omega_t \quad [5]$$

where M_t is the level of imports; Y is the level of domestic income; P is relative export and import good prices measured in a common currency (i.e. the international terms of trade); T is the tariff (the customs duty, measured as the ratio between customs revenue and import value); M_{t-1} is the lagged dependent variable and ω is a stochastic error term.

The short run income, price and tariff elasticities are β_1, β_2 and β_3 respectively and the expected signs are: β_1 and $\beta_2 > 0$; $\beta_3 < 0$.

Differentiating with respect to time gives (Madsen, 2001; Santos-Paulino and Thirlwall, 2004):

$$m_{it} = b_i + b_1 y_{it} + b_2 p_{it} + b_3 t_{it} + b_4 m_{it-1} + \varepsilon_{it} \quad [6]$$

where m is the rate of change of imports, b_i is a constant (the country fixed effect), y is the growth of domestic income; p is the rate of change of the international terms of trade; t is the rate of change of tariffs; m_{t-i} is the lagged dependent variable growth; ε is a stochastic error term; $_i$ is the country and $_t$ is time.

This model [6], in the same way as the previous model in the aggregate analysis, was modified to better specify the impact of the multilateral trade integration process on the analyzed relationship. Therefore, dummies relating to the negotiation rounds within the GATT were used. The estimated model thus becomes:

$$m_{it} = b_i + b_1 y_{it} + b_2 p_{it} + b_3 t_{it} + b_4 m_{it-1} + b_5 dROUND_5 + \varepsilon_{it} \quad [7]$$

where $dROUND_5$ is a binary dummy relating to the negotiation rounds already introduced in the aggregate analysis (which takes value 1 when this event is present for the country and 0 otherwise). The data used in the panel model are taken from the World Bank's World Development Indicators (WDI, 2003). Unlike the aggregate analysis, this therefore concerns standard data commonly used for the study of these phenomena.

In particular, the annual imports of goods and services (US dollars, constant 1995 values), the annual income (US dollars, constant 1995 values), the terms of trade index of goods and services (1995=100) and the customs duties expressed in percentages of imports were taken into account. The chosen model is a fixed effect panel model[18]. It is well known that the fixed effect model permits to model individual effects of each unit representing specific and constant factors

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[17] Panel data consider the longitudinal dimension of data control for heterogeneity among units and give less collinearity among the variables, producing more reliable parameter estimates (Baltagi, 2001).

(Greene, 1997). This model was chosen because, in this case, the country-specific effects become very important to analyze the impact of a specific element (i.e. tariff) on trade. These factors are deterministically related to the country specific characteristics and - as a consequence - can not be considered as random. Moreover, a fixed effect estimator – including in a constant term all the country-specific characteristics - avoids misspecification problems due to omitted variables.

An estimate of the entire group of countries was then carried out followed by a second analysis disaggregated by groups, distinguishing between industrialized and developing countries. The model was also estimated taking into account trade levels instead of the changes.

4.2.1. Outcome of the panel analysis

The estimates carried out highlight the goodness of the estimated relation (Table 4.4). The values of the parameters are robust and significant and the coefficients signs are those expected.

Table 4.4

Fixed effects panel analysis 1961-2000

Explanatory variables	Dependent variable: IMPORT GROWTH $[m_t]$		
	1	2	3
Lagged import growth $[m_{t-1}]$	0,0852	0,0849	0,0616
	(2.65)***	(2.65)***	(1.92)***
Domestic income growth $[y]$	2,4050	2,4048	2,4213
	(20.14)***	(20.14)***	(20.62)***
Tariff change $[t]$	-0,0123	-0,0115	-0,0006
	(1.22)	(1.15)	(0.59)
Relative price change $[p]$	0,2389	0,2417	0,2278
	(4.62)***	(4.67)***	(4.47)***
Constant $[c]$	-0,0209	-0,0509	-0,0325
	(4.12)***	(1.78)**	(5.67)***
Dillon-Kennedy Round Dummy $[dR_2]$		0,0358	
		(1.06)	
Tokyo Round Dummy $[dR_3]$			0,0321
			(4.10)***
F-test	[0.0000]	[0.0000]	[0.0000]
R^2	0,53	0,53	0,55
No. countries/No. observations	23/481	23/481	23/481

Notes:

Figures in parenthesis ( ) are absolute t-ratios; figures in brackets [ ] are p-values. * indicates that a coefficient is significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level.

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[18] Usually, using the standard within-group estimator for dynamic models with fixed individual effects generates estimates that are inconsistent since the number of "individuals" tends to infinite if the number of time periods is kept fixed (see Nerlove, 1967; Nickell, 1981). This is particularly so when the time dimension of the panel (T) is small and N tends to infinite and the bias is of order 1/T. However, as the number of temporal periods used in this analysis is quite high (for panel data), the distortion produced by the inclusion of the lagged dependent variable will be slight.

To better understand the structural differences between the countries considered, we proceeded, as already mentioned, to separately estimate the target relation between industrialized and developing countries. The substantial difference between the two groups of countries mainly consists in the greater significance of the relationship between trade liberalization and tariff barriers in the case of industrialized countries. The estimate relating to this group of countries (Table 4.5) in fact highlights how the coefficients referring to the tariff changes and to the dummies relating to the further effects of liberalization linked to the various negotiating rounds within the GATT, are more significant than those relating to the group of developing countries (Table 4.6), although even in this case they are not particularly relevant. Nevertheless, in the case of developing countries, as well as in the industrialized countries, the further effect of liberalization linked to the Tokyo Round results as significant, although moderately so.

The greater significance of the relationship between trade liberalization and tariff barriers in the case of industrialized countries compared to developing countries confirms the existence of a structural difference between the two groups of countries in relation to the elasticity of trade flows to tariff changes. However, such empirical evidence may also be due to the fact that the developing countries liberalized very little in the postwar period, adopting "free-rider" behavior, or rather, oriented to taking advantage of the liberalization that came about between the industrialized countries, without obligations of reciprocity[19].

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[19] As concerns the results relating to developing countries, is it important to always keep in mind the possibility that the results may be distorted due the previously mentioned problems linked to the measurement of tariffs.

Table 4.5

Fixed effects panel analysis -Industrialized Countries 1961-2000

Explanatory variables	Dependent variable: IMPORT GROWTH [m_t]		
	1	2	3
Lagged import growth [m_{t-1}]	-0,0012	-0,0027	-0,0248
	(0.03)	(0.06)	(0.60)
Domestic income growth [y]	2,1877	2,1921	2,2347
	(15.35)***	(15.43)***	(15.85)***
Tariff change [t]	-0,0126	-0,0118	-0,0082
	(1.85)**	(1.73)*	(1.20)
Relative price change [p]	0,2336	0,2414	0,2170
	(4.38)***	(4.53)***	(4.12)***
Constant [c]	-0,0112	-0,0475	-0,0177
	(2.28)**	(2.27)**	(3.38)***
Dillon-Kennedy Round Dummy [dR_2]		0,0370	
		(1.79)*	
Tokyo Round Dummy [dR_3]			0,0199
			(3.24)***
F-test	[0.0000]	[0.0000]	[0.0000]
R^2	0,49	0,49	0,50
No. countries/No. observations	14/303	14/303	14/303

Notes:

Figures in parenthesis ( ) are absolute t-ratios; figures in brackets [ ] are p-values. * indicates that a coefficient is significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level.

Table 4.6

Fixed effects panel analysis - Developing Countries 1961-2000

Explanatory variables	Dependent variable: IMPORT GROWTH $[m_t]$		
	1	2	3
Lagged import growth $[m_{t-1}]$	0,1077	0,1153	0,0757
	(2.04)**	(2.18)**	(1.43)
Domestic income growth [y]	2,4897	2,3846	2,4832
	(12.11)***	(11.92)***	(12.34)***
Tariff change [t]	-0,0190	-0,0241	-0,0139
	(0.53)	(0.67)	(0.40)
Relative price change [p]	0,2306	0,2243	0,2270
	(2.47)***	(2.41)**	(2.49)**
Constant [c]	-0,0249	-0,0208	-0,0495
	(2.32)**	(2.20)**	(3.66)***
Dillon-Kennedy Round Dummy $[dR_2]$		0,0025	
		(0.15)	
Tokyo Round Dummy $[dR_3]$			0,0531
			(2.90)***
F-test	[0.0000]	[0.0000]	[0.0000]
R^2	0,55	0,55	0,57
No. countries/No. observations	9/178	9/178	9/178

Notes:

Figures in parenthesis ( ) are absolute t-ratios; figures in brackets [ ] are p-values. * indicates that a coefficient is significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level.

An estimate of the panel model considering the average *level* of tariffs in place of variations (Pacheco-Lopez, 2005; Santos-Paulino and Thirlwall, 2004) was also carried out. These estimates broadly confirm the above results, but render them more robust[20].

In conclusion, the panel estimates also demonstrate that the relation between tariffs and trade, despite being confirmed at the empirical level, appear to be less important and significant in today's trading operations. If international trade flows seem to have changed their nature over time (from inter-sectoral trade to mostly intra-sectoral trade), then this has also influenced the

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[20] In particular, the effect of the trend of the average level of tariffs compared with the variation of imports proves to be more significant for all the estimates, even if confirmed as little relevant. It is interesting to note that in the case of developing countries, a relatively greater effect on the average level of tariffs on trade was registered, also in consideration of the higher average level of tariffs with respect to those currently in force in more industrialised countries.

trade policy of partner countries, which is now implemented through wide recourse to restrictive foreign trade measures of a non-tariff nature, rather than the traditional tariff barriers.

4.3.   Final remarks on the empirical analysis

In relation to the objectives of this empirical analysis, the following observations can be made:

- the long-run relationship between tariffs and trade, once controlled for other factors that influence international trade (income and relative prices), seems to be confirmed at the empirical level. However, from the 1950's onwards, tariff changes seem to have had a significantly lesser effect on trade flow changes, if not in a limited way - and have little importance - in the case of industrialized countries;

- the relation between tariffs and trade is particularly relevant and significant in the period prior to World War II, when tariff liberalization was essentially linked to the post-*Cobden Chevalier Treaty* bilateral agreements and there was no a multilateral trading system such as that in existence from World War II onwards;

- however, in the years following World War II, the multilateral system seems to have generated a certain additional effect, albeit modest, on the growth of world trade, compared to that in the previous trading system. This effect was particularly relevant in the Tokyo Round period, the first round in which the GATT system attempted in real terms to tackle broader issues than mere tariff liberalization;

- the minor significance of the relationship between tariff liberalization and international trade from the 1950s onwards, seems to highlight that the role of the GATT is more linked to the *interaction effect*, here understood as participation in international trade, than to the *integration effect*, intended as the reduction of tariff barriers;

- finally, the panel analysis has highlighted the relative greater significance, for industrialized countries rather than developing countries, of both the relation between tariffs and trade and the additional contribution in terms of the "interaction effect" of the GATT system. This is consistent with other empirical analyses on this issue and is motivated by the fact that developing countries, up to the Uruguay Round, participated in the multilateral system essentially as free-riders, without incurring specific obligations of reciprocity nor benefiting directly from the "interaction effect", guaranteed by the existence of a formalized system governing trade policy on a multilateral basis.

The results obtained in the empirical analysis are partly in line with those recently highlighted by the empirical literature on this subject (Rose, 2004a; 2004b; 2005). The GATT/WTO international trading system, which has undoubtedly played a decisive role in the reduction of tariff barriers, operates in a historic moment where the relationship between the reduction of tariff barriers and trade growth seems to have weakened considerably. This means that the Organization's reason for being is rather to be sought in its ability to establish a favorable climate for international trade at world level. In this sense, some progress, albeit modest, was recorded from the Tokyo Round onwards and in this same vein, even more significant effects can probably be attributed to the Uruguay Round. The Tokyo Round (1973-79) marks the watershed between the Rounds dedicated mainly to the reduction of tariff barriers and those focused on broader objectives than mere tariff liberalization, amongst which matters of non-tariff barriers particularly. The Uruguay Round, the last round of negotiations within the GATT (1986-1994), significantly extended the number of issues as objects of negotiation, widening the scope of the GATT's intervention on agricultural products, services, investment, intellectual property rights, etc. The changed political climate, also linked to the end of the opposing-blocks policy that characterized international relations during the "Cold War", encouraged the definitive institutionalization of the multilateral trade regime in that period with the creation of the WTO, a

true multilateral trading institution, foreseen since the 1947 Havana Charter but never created due to the lack of a clear political will among the main world trade powers.

Further effects may yet be produced by the subsequent negotiations conducted within the WTO. However, even if it is still too early to fully assess the effectiveness of these recent events, it is essential to emphasize that these negotiation processes have not in fact led to significant concrete results. As yet, the new multilateral negotiations that were interrupted in Seattle in 1999, have not been able to be brought to term.

5.   Conclusions

The empirical results presented, fruit of a historical reconstruction of the statistical data of trade and tariffs of the main commercial world powers for the 1871-2000 period, confirm the existence of a long-run relation, at world level, between tariffs and trade.

This empirical evidence is consistent with the theoretical literature that postulates the existence of an inverse relationship between tariff barriers and foreign trade. Tariff liberalization, as emphasized by both traditional trade theory and the more recent contributions of literature, produces changes in relative prices that determine the shift of resources from the import-substitution goods sectors to the export goods sectors, leading to a better allocation of resources and as such increasing the production, consumption and welfare of the partner countries. This occurs as much in the so-called "small" countries as in "large" countries, even if, in the latter case, the positive effect of tariff liberalization could be limited by the peculiar trends of the terms of trade that tend to worsen rather than improve.

This relation, relevant and significant in the period prior to World War II, gradually lost importance and significance from 1950 onwards. The results obtained are therefore partly in line with those recently highlighted by empirical literature on this subject (Rose, 2004a; 2004b; 2005). The GATT/WTO international trading system operates in a historic moment where the relationship between the reduction of tariff barriers and trade growth seems to have considerably weakened.

This strengthens the argument of those who think that the presence of a non-formalized trade regime such as that preceding the current GATT/WTO multilateral system, is sufficient to determine effects on growth of world trade through the reduction of tariff barriers. In the second half of the 1800s, the European economy experienced a positive phase, characterized by significant expansion of trade and economic development, both due to the technological progress following the application of steam technology to land and sea transport, but also due to a general reduction of customs barriers throughout continental Europe, fruit of the establishment of a network of widespread bilateral trade agreements followed by the *Cobden-Chevalier Treaty* between France and the United Kingdom.

On the other hand, it is a fact, from a historical perspective, that greater tariff liberalization was achieved only during the post-World War II period contemporarily with the creation of a formalized trading system at multilateral level. Greater tariff liberalization does not appear, however, to have been the main cause for the extraordinary growth of trade flows that occurred in the post-World War II period. It seems, rather, that the formalization of a trade regime on a multilateral basis determined the stimulation of the formation of a more open international economic-political climate and more favorable to international economic integration.

This also highlights how the "GATT effect", the flywheel of trade, is not so much linked to tariff liberalization, as in the case of earlier regimes, but rather to the ability to contribute to trade growth thanks to the realization of a generally more conducive climate to trade through policies designed to ensure the certainty of rules and the behaviors of major players.

The diverse effects of the multilateral trading system among developing and industrialized countries emerging from the panel analysis effectively emphasize how the GATT/WTO system has favored, in concrete terms, member countries that actively participated in the management of the multilateral trade policy. As regards developing countries, no meaningful relationship emerges

between the reduction of tariff barriers and trade growth, and the particular relevance of accession to the GATT/WTO even less so. This is in line with that which has been affirmed by many (Hoekman and Kostecki, 2001). Developing countries, whilst benefiting from significant exemptions from obligations deriving from accession to multilateral agreements, have not participated in the governing of trade policy on a multilateral basis, assured by the existence of a formalized system.

In summary, the success of the GATT seems to be more closely linked to the *interaction effect*, here understood as participation in international trade, than to a specific *integration effect*, understood as a reduction of tariff barriers. However, it is difficult to give a definitive response to the issue of the relative effectiveness of institutionalized and non-institutionalized trade regimes.

The proposed work, confirming the long-run relation between trade liberalization and trade growth, highlights at the same time the importance of the presence of a formalized multilateral trading system with respect to an informal system based on a network of bilateral agreements, not so much in reference to the mere effectiveness of guaranteeing tariff liberalization, but rather in the capacity to build a virtuous process of international coordination of trade policies and to ensure a fairer and more complete participation in world trade.

It may therefore be reasonably assumed that the WTO's real reason for being and, consequently, its role in future trade policy, is linked to the need to ensure international institutional coordination oriented to the achievement of broader and more extensive global economic interaction.
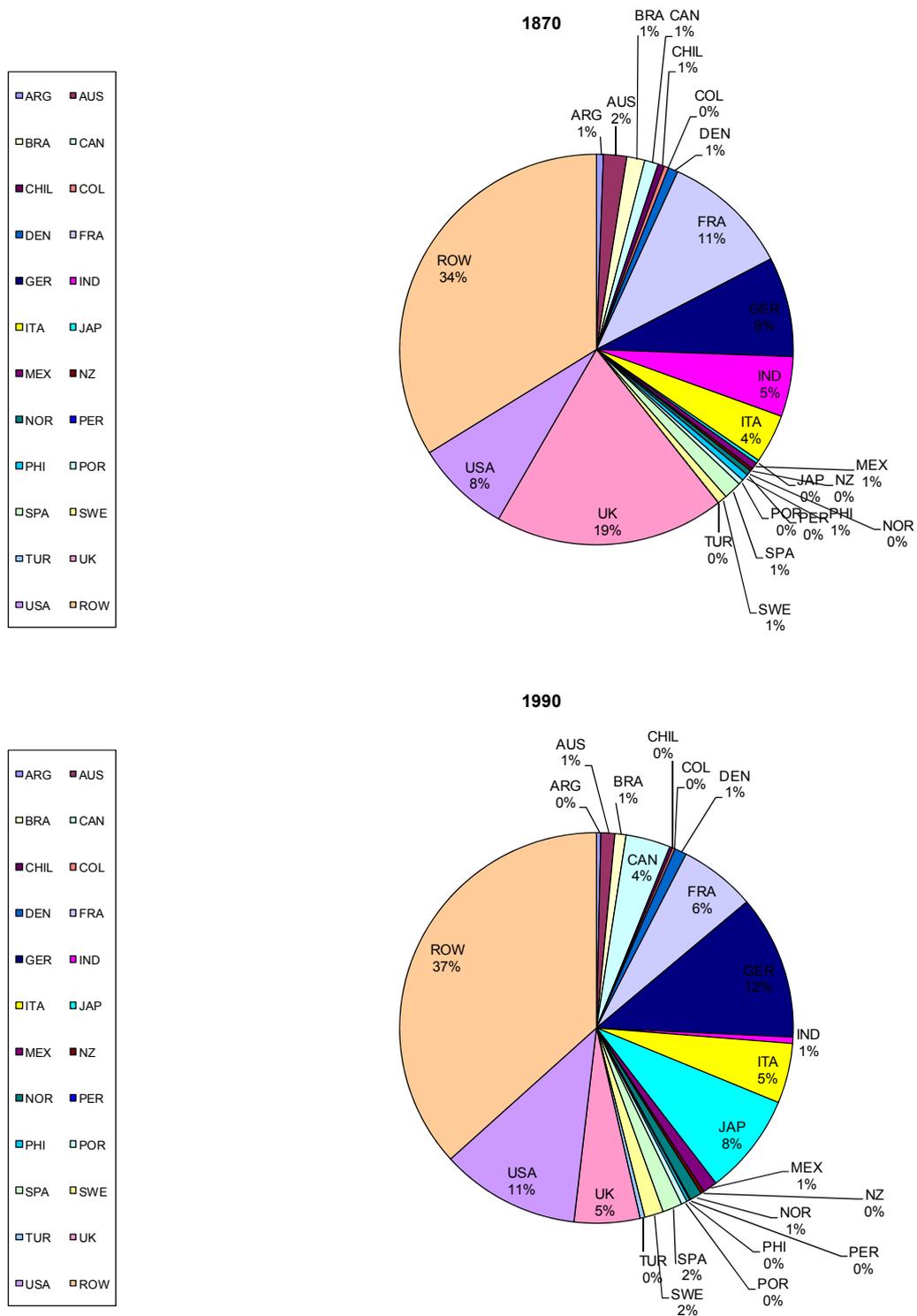
Accession to such a system would have definite advantages linked to the effective participation to world trade of all countries, surmounting the current situation of the relative commercial marginalization of developing countries. In this sense, the GATT/WTO system, although today less important in ensuring tariff liberalization and as yet ineffective in promoting non-tariff liberalization, remains fundamental to ensure the "public good' of international coordination, from a trade point of view, among member and non-member States; promoting the adoption of a system of rules and procedures for dispute settlements; to encourage the launch of virtuous processes of international integration by establishing pro-trade rules and standards of conduct.

An efficient world trade organization is essential, above all, for developing countries, since the alternative represented by bilateral and regional agreements would increase trade diversion and discrimination, the lack of a mechanism for the settlement of international disputes characterized by impartiality with respect to the parties in conflict; as well as exclusion from sensitive negotiation policies (such as agricultural policy and anti-dumping measures).

In this light, the current "Development Round" is the key node, not only to ensure more advanced forms of trade integration in the near future and to deal with the issue of "invisible barriers", but also and especially to confirm the credibility of an institution whose legitimacy, as seen, is today being questioned.

Appendix

Figure: A.1 – Share in world trade of the analyzed countries: 1870 and 1990 (percentage)

1870

Legend: ARG, AUS, BRA, CAN, CHIL, COL, DEN, FRA, GER, IND, ITA, JAP, MEX, NZ, NOR, PER, PHI, POR, SPA, SWE, TUR, UK, USA, ROW

ROW 34%, FRA 11%, GER 8%, UK 19%, USA 8%, IND 5%, ITA 4%, AUS 2%, ARG 1%, BRA 1%, CAN 1%, CHIL 1%, COL 0%, DEN 1%, MEX 1%, JAP 0%, NZ 0%, POR 0%, PER 0%, PHI 1%, NOR 0%, TUR 0%, SPA 1%, SWE 1%

1990

Legend: ARG, AUS, BRA, CAN, CHIL, COL, DEN, FRA, GER, IND, ITA, JAP, MEX, NZ, NOR, PER, PHI, POR, SPA, SWE, TUR, UK, USA, ROW

ROW 37%, GER 12%, USA 11%, JAP 8%, FRA 6%, ITA 5%, UK 5%, CAN 4%, AUS 1%, ARG 0%, BRA 1%, CHIL 0%, COL 0%, DEN 1%, IND 1%, MEX 1%, NZ 0%, NOR 1%, PER 0%, PHI 0%, POR 0%, SPA 2%, SWE 2%, TUR 0%

Source: Author's processing

25

Table A.1 - Stability Test: Chow Breakpoint Test: 1950

F-statistic	3.53	Probability	0.006
Log likelihood ratio	18.01	Probability	0.002

Table A.2

Long-run coefficients derived from the ARDL approach 1951-1986

	Dependent variable: EXPORTS[1] (ln) $[x_w]$
Explanatory variables	1
World income $(\ln)^2$ $[Y_w]$	1,0870
	(24.37)***
Relative prices (ln) $[P_w]$	-2,3053
	(2.76)***
Tariffs (ln) $[T_w]$	-1,9967
	(5.98)***
No. of observations	36

Notes:

Figures in parenthesis ( ) are absolute t-ratios; figures in brackets [ ] are p-values. * indicates that a coefficient is significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level.

[1] Exports of the 23 main world export countries

[2] Sum of income values of 29 countries (about 70% of world income for the period considered)

References

Agosin M. (1991) "Trade policy reform and economic performance: a review of the issues and some preliminary evidence", UNCTAD Discussion Papers, No. 41, Geneva, Switzerland.

Ahmed N. (2000) "Export responses to trade liberalisation in Bangladesh: a cointegration analysis", *Applied Economics*, vol. 32, pp. 1077–84.

Amisano G. (2004) *Elementi di econometria*, Edumond, Mondadori, Milano.

Anderson J. and Wincoop E. van (2003) "Gravity with gravitas: A solution to the border puzzle", *American Economic Review*, 93, pp. 170-192.

Bairoch P. (1976) *Commerce extérieur et développement économique de l'Europe au XIX siècle*, Paris, Monton.

Bairoch P. (1989) "European Trade Policy, 1815-191" in P. Mathias and S. Pollard (eds.), The Cambridge Economic History of Europe, vol. III, Cambridge: Cambridge University Press.

Bairoch P. (1993) *Economics and world history: myths and paradoxes*, Chicago, University of Chicago Press.

Balassa B. (1965) "Tariff Protection in Industrial Countries: An Evaluation", *Journal of Political Economy*, December.

Balassa B. (1967) "Trade Creation and Trade Diversion in the European Common Market", *The Economic Journal*, Vol. 77, London, 1967.

Baldwin R. (1994) *Towards an Integrated Europe*, CEPR, London.

Baldwin R. E. and Lewis W. E. (1978) *U.S. Tariff Effects on Trade and Employment in Detailed SIC Industries*, in William G. Dewald (ed.) The Impact of International Trade and Investment on Employment, Washington: Government Printing Office.

Baldwin R.. E. and Martin P. (1999) "Two Waves of Globalisation: Superficial Similarities, Fundamental Differences", National Bureau of Economic Research, Working Paper n. 6904, Cambridge Mass.

Baltagi B. H. (2001) *Econometric Analysis of Panel Data*, J. Wiley & Sons, Chichester, England.

Basevi G., Calzolari G. and Ottaviano G. (2001) *Economia politica degli scambi internazionali*, Carocci ed., Roma.

Bhagwati J.N. (1988) *Protectionism*, MIT Press, Cambridge (Mass.)

Bleaney M. (1999) "Trade reform, macroeconomic performance and export growth in ten Latin American countries 1979–95", *Journal of International Trade and Economic Development*, vol. 8 (March), .pp. 89–105.

Capie F. (1994) *Tariffs and Growth: some illustrations from the world economy, 1850-1940*, New York, Manchester University Press.

Charemza, W.W. and Deadman, D.F. (1993) *New Directions in Econometric Practice*, Edward Elgar.

Clarke R. and Kirkpatrick C. (1992) 'Trade policy reform and economic performance in developing countries: assessing the empirical evidence', in R. Adhikari, C. Kirkpatrick e J. Weiss, (eds.), Industrial and Trade Policy Reform in Developing Countries, Manchester: Manchester University Press.

Clemens M. A. and Williamson J. G. (2001) "A Tariff-Growth Paradox? Protection's Impact the World Around 1875-1997," NBER Working Paper 8459, Cambridge, Mass.

Cline W. R., Kawanabe T.O., Kronsjo M. and Williamset T. (1978) *Trade Negotiations in the Tokyo Round: A Quantitative Assessment,* Brookings Institution.

Coatsworth J. H. and Williamson J. G. (2002) "The Roots of Latin American Protectionism: Looking Before the Great Depression," NBER Working Paper 8999, Cambridge, Mass.

Dickey D. A. and Fuller W. A (1979) "Distribution of the estimators for autoregressive time series with a unit root", *Journal of the American Statistical Association*, 74.

Engle R.F. and Granger C.W.J. (1987) "Co-integration and error correction: representation, estimation and testing", *Econometrica*, vol. 55.

Feenstra R.C (1995) "Estimating the Effects of Trade Policy", in G. M. Grossman, K. Rogoff (ed), Handbook of International Economics, vol. III, Elsevier, Amsterdam.

Goldstein M. and Kahn M.S. (1985) "Income and price effects in foreign trade", in Jones and Kenen eds., Handbook of International Economics, vol. 2, North-Holland, Amsterdam.

Greenaway D. and Sapsford D. (1994) 'What does liberalisation do for exports and growth', *Weltwirtschaftliches Archive*, vol. 30.,pp. 157–74.

Greene W. (1997) *Econometric Analysis*, 3rd edition, London: Prentice Hall.

Grilli E. R. and Cheng Yang M. (1988) "Primary Commodity Prices, Manufactured Goods Prices, and the Terms of Trade of Developing Countries: What the Long Run Shows", *The World Bank Economic Review*, Vol. 2, N.1.

Hamilton J. D. (1994) *Time Series Analysis*, Princeton University Press, New Jersey.

Harrigan J. (1993) "OECD imports and trade barriers in 1983," *Journal of International Economics*, vol. 35, 91-111.

Helleiner G. (ed.) (1994) *Trade Policy and Industrialisation in Turbulent Times*, London, Routledge.

Helpman E. and Krugman P. R. (1985) *Market Structure and Foreign Trade: Increasing Returns, Imperfect Competition, and the International Economy*, Cambridge, MA: MIT Press.

Hoekman B. M. e Kostecki M. M. (2001) *The Political Economiy of the World Trading System. The WTO and Beyond*, Oxford University Press, II ed.

Hofman A. (2000) *The Economic Development of Latin America in the Twentieth Century*, Edward Elgar, Cheltenham, UK.

Hufbauer G. C. (2002) "Wrong test applied to trading system", *Financial Times*, 21 November.

Irwin D. A. (1994) "The GATT's Contribution to Economic Recovery in Post-War Western Europe", NBER Working Papers No. 4944.

Jenkins R. (1996) 'Trade performance and export performance in Bolivia', *Development and Change*, vol. 27, pp. 693–716.

Johnson H.G (1954) "Optimum Tariff and Retaliation", *Review of Economic Studies*, 21.

Joshi V. and Little I.M.D. (1996) *India's Economic Reforms 1991–2001*, Oxford: Oxford University Press.

Krueger A.O. (1978) *Foreign trade regimes and economic development: Liberalization attempts and consequences*, Cambridge, MA: Ballinger Pub. Co. per NBER.

Krueger A. O. ed. (1998) *The WTO as an International Organization*, the University of Chicago Press

Leamer E. (1990) "Testing Trade Theory," NBER Working Paper n.3957.

Leamer E. E. and Stern R.M. (1970) *Quantitative International Economics*, Allyn and Bacon, Inc., Boston.

Leith J.C. and Reuber G. L.(1969) "The Impact of the Industrial Countries' Tariff Structure on Their Imports of Manufactures from Less-Developed Areas: A Comment", *Economica*, 1969, vol. 36, N.141.

Low P. (2002) "WTO is about more than just free trade", *Financial Times*, Letters to the Editor, November 14.

Maddison A. (1982) *Phases of capitalist development*, New York, Oxford University Press.

Maddison A. (1989) *The world economy in the 20th century*, Development Centre of the OECD, Paris.

Maddison A. (1995) *Monitoring the World Economy 1820-1992*, Paris, OECD.

Maddison A. (2001) *The world economy: a millennial perspective*, Development Centre of the OECD, Paris.

Madsen J. B. (2001) "Trade barriers and the collapse of world trade during the Great Depression", *Southern Economic Journal*, vol. 67, 4.

Mitchell B. R. (1992) *International Historical Statistics: Europe, 1750-1988*, Macmillan, New York.

Mitchell B. R. (1998a) *International Historical Statistics: Africa, Asia & Oceania, 1750-1993*, London, Macmillan.

Mitchell B. R. (1998b) *International Historical Statistics: Europe, 1750-1993*, Macmillan, Reference Ltd Oxford.

Mitchell B. R. (1998c) *International historical Statistics: the Americas, 1750-1993*, London, Macmillan.

Nelson C.R. and Plosser C. (1982) "Trends and random walks in macroeconomic time series", *Journal of Monetary Economics,* vol.10.

Nenci, S. and Pietrobelli, C. (2008) "Does Tariff Liberalization Promote Trade? Latin American Countries in the Long-Run (1900-2000)," *Global Economy Journal*: Vol. 8, 4, Article 2.

O'Rourke K. (2000) "Tariffs and Growth in the Late 19th Century", *The Economic Journal*, 110.

O'Rourke K. (2001) "Globalization and Inequality: Historical trends", NBER Working Paper N. 8339.

Ostry J. and Rose A. (1992) "An Empirical Evaluation of the Macroeconomic Effects of Tariffs," *Journal of International Money and Finance*, Vol. 11, pp. 63–79.

Pacheco-López P. (2005) "The effect of trade liberalisation on exports, imports, the balance of payments and growth: the case of Mexico", *Journal of Post Keynesian Economics*, vo. 27, 4, pp. 595 - 619.

Papageorgiou, D., Michaely M., and Choski A. (1990) "Liberalizing Foreign Trade in Developing Countries", in Lessons of Experience in the Developing World, vol. 7, Basil Blackwell for The World Bank, Oxford.

Pesaran M. and Pesaran B. (1997) *Working with Microfit 4.0 Interactive Econometric Analysis*, Oxford University Press, Oxford.

Pesaran MH. and Shin Y. (1999) *An autoregressive distributed lag modelling approach to cointegration analysis*, in Econometrics and Economic Theory in the 20th Century: The Ragnar Frisch Centennial Symposium, Strom S (ed.). Cambridge University Press, Cambridge.

Phillips P.C.B. and Perron P. (1988) "Testing for a unit root in time series regression", *Biometrika*, 75.

Ray E. J. (1981) "Tariff and Nontariff Barriers to Trade in the United States and Abroad", *The Review of Economics and Statistics*, Vol. 63, No.2.

Rose A. K. (2004a) "Do We Really Know that the WTO Increases Trade?", *The American Economic Review*, Vol. 94, No. 1, March, pp.98-147 previously appeared as NBER Working Paper No. 9273 (2002).

Rose A. K. (2004b) "Do WTO Members Have A More Liberal Trade Policy?", *Journal of International Economics*, 63(2), pp. 209–35.

Rose A. K. (2005) "Does the WTO Make Trade More Stable?", *Open economies review* 16, pp. 7–22, 2005.

Sachs J. and Warner A. (1995) "Economic Reform and the Process of Global Integration", Brookings Papers on Economic Activity, N.1.

Santos-Paulino A. and Thirlwall A. P. (2004) "The Impact of Trade Liberalisation on Exports, Imports and the Balance Of Payments of Developing Countries", *The Economic Journal*, vol.114 February.

Senhadji, A.S. and Montenegro, C. (1999) 'Time series analysis of export demand equations: a cross-country analysis', *IMF Staff Papers*, vol. 46 (September/December), pp. 259–73.

Shafaedin S.M. (1994) 'The impact of trade liberalisation on exports and GDP in least developed countries', *UNCTAD Discussion Papers* No. 85, Geneva.

Smith A. (1776) *The Wealth of Nations*, Ed. Italiana del 1975, Classici UTET.

Stolper W. F. and Samuelson P. A. (1941) "Protection and Real Wages", *Review of Economic Studies*, November.

Subramanian A. and Wei S. (2007) "The WTO Promotes Trade, Strongly but Unevenly", *Journal of International Economics,* vol.72, 1, pp.151-175

Tomz, M., Goldstein J.L., and D.Rivers. (2007) "De We Really Know That the WTO Increases Trade? Comment." *American Economic Review*, 97(5), pp.2005-2018.

Thirlwall A.P. (2003) *Growth and Development: with Special Reference to Developing Economies*, 7th edition, Palgrave-Macmillan, London.

Thomas V., Nash J. and Edwards S. (1991) *Best Practices in Trade Policy Reform*, Oxford: Oxford University Press for the World Bank.

Trefler D. (1993) "Trade Liberalization and the Theory of Endogenous Protection: An Econometric Study of U.S. Import Policy", *Journal of Political Economy*, 101, 138-160.

Unctad (1989) *Trade and Development Report*, UNCTAD, Geneva

Unctad (2004) *World Investment Report*, Geneva.

Vamvakidis A. (2002) "How Robust is the Growth-Openness Connection? Historical Evidence", *Journal of Economic Growth*, vol.7.

Weiss J. (1992) 'Export response to trade reforms: recent Mexican experience', *Development Policy Review*, vol. 10, pp. 43–60.

World Bank (1987) *World Development Report*, Oxford University Press, New York.

World Bank (2003) *World Investment Indicators 2003* CD-ROM, The World Bank, Washington, DC.