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Anthony P. Thirlwall's Theory of Economic Development, Growth and Finance: An Analytical Appraisal from Mexico
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Trade Liberalization Effects on Economic Growth, 1980-2022

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Abstract

The orthodox view of the effect of trade on GDP per capita assumes greater growth and equity, the heterodox theory refutes the argument and predicts inequitable and divergent results between countries. We resume the discussion using information from 1980 to 2022 in 102 countries, applying a panel data methodology and slope disaggregation. The goal is to test whether trade has adverse effects in lower-income countries and how the effect has changed over time. The results show that trade negatively affects GDP per capita growth mainly through imports, this tends to worsen over time and the impact is greater in poor countries. The main implication is the growing income divergence between nations; the recommendation is that governments and multilateral organizations continue to explore ways to balance and socialize trade. It is concluded that heterodox postulates, such as the vision of Thirlwall on trade, continue to be valid. The originality of the document lies in the disaggregation of results by countries and time blocks, as well as exports and imports.

JEL Classification: B5, C5, C33, F1, F4, 057.

Keywords: trade, GDP per capita growth, panel data, income inequality.

Efectos de la liberalización comercial en el crecimiento económico, 1980-2022

Resumen

La visión ortodoxa del efecto del comercio sobre el PIB per cápita supone mayor crecimiento y equidad, la teoría heterodoxa refuta el argumento y predice resultados inequitativos y divergentes entre países. Reanudamos la discusión utilizando información de 1980 a 2022 en 102 países, aplicando una metodología de datos panel y desagregación de pendientes. El objetivo es probar si el comercio tiene efectos adversos en países de menores ingresos y como el efecto ha cambiado en el tiempo. Los resultados muestran que el comercio afecta negativamente el crecimiento del PIB per cápita principalmente a través de las importaciones, esto tiende a empeorar con el tiempo y el impacto es mayor en países pobres. La principal implicación es la creciente divergencia de ingresos entre las naciones, la recomendación es que gobiernos y organismos multilaterales continúen buscando formas de equilibrar y socializar el comercio. Se concluye que postulados heterodoxos, como la visión de Thirlwall sobre el comercio, continúan teniendo vigencia. La originalidad del documento radica en la desagregación de resultados por países y bloques de tiempo, así como exportaciones e importaciones.

Clasificación JEL: B5, C5, C33, F1, F4, 057.

Palabras clave: comercio, crecimiento del PIB per cápita, datos panel, desigualdad de ingresos.

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1. Introduction

Thirlwall´s theory explains the causes of the divergence economic growth between countries but also elaborates on the conditions that must be met to get economic development. His ideas strength rests on the shoulders of giants like Smith (1776) and Kaldor (1966, 1967,1970) as well as many others, from whom he takes up the importance of labour specialisation, and demand and the external sector in economic growth.

One of the later Thirlwall´s areas of work was the effects of trade liberalisation on economic growth. Since the eighties of the last century, countries worldwide modified their strategy towards higher levels of trade openness, eliminating tariffs on exports and imports (Rodrik, 1992). Although, with the existence of differences in the levels of opening, and perhaps more importantly in the strategies to achieve it.

The changes in trade policy were accompanied by the creation of various regional trade agreements in Latin America, Europe, Africa and Asia. And at the international level with the emergence of the World Trade Organization, whose purpose was to promote trade between countries.

From orthodoxy it was argued that trade openness would lead to higher levels of growth and convergence between countries because trade would allow the exploitation of the comparative advantages of each country which then would be reflected in specialization and productivity increases. Second, the expansion of international trade would allow technology transfer to strengthen productive capacities. Third, due to the two previous factors, there would be an improvement in wages and aggregate income. Finally, the lack of monetary resources would be solved through the opening of the financial account, which would relax the restrictions imposed by the insufficiency of domestic savings.

However, the presence of low levels of economic growth in countries that liberalised their economies (like Africa and Latin American countries) is the basis for questions about the benefits of trade openness. Thirlwall and Pacheco-López (2008) point out that trade liberalisation by itself does not bring higher levels of economic growth, since it also requires a strategy that allows moving towards the export of goods with high added value. They point out that openness has not brought the benefits as argued by orthodox economics because developing economies have also faced competition from other developing economies, preventing the increase in productivity and wages.

The evidence shows heterogeneous results because in some countries or regions (e.g., Latin America) trade liberalisation seems not to have had the expected effects on economic growth, while others have reached high development levels (as Southeast Asia).

This work's objective is to determine the effect of trade openness on GDP per capita in a sample of 102 developed and developing countries from 1970 to 2022. The most important contribution is to show the relationship of trade, expressed as exports, imports and trade volume, with the growth of GDP per capita of the countries, in an aggregate manner and disaggregating into six groups of countries based on a classification by income level obtained from the World Bank (2024). It contributes to the applied literature by providing evidence on the effects of liberalization in countries with similar income levels. There are no works in the recent literature that use this approach or at least do not use data over a long period as in the present article.

The results indicate that trade tends to affect GDP per capita growth negatively in all groups of countries, but the effect decreases as the countries' income increases, generating a divergent effect between economies. The adverse effect of trade is given by imports, while exports have a positive effect on GDP per capita, but this tends to decrease with the income level of the countries, this trend contributes to increasing the divergence.

The methodology uses estimates of ordinary least squares, fixed effects and random effects in an aggregate manner and disaggregating slopes of the trade and GDP per capita variables with the application of interactive dummy variables.

The work is divided into five parts, including this introduction. In the second part, the orthodox and heterodox theoretical approaches of the effects of trade openness on economic growth are reviewed. In the third, the most relevant aspects of the international evolution of trade and growth in the main regions of the world are reviewed, as well as some results from the empirical literature. In the fourth part, an econometric estimation is carried out using a panel data model for a sample of 102 countries from various regions of the world to determine the effect of openness on the GDP per capita. In the fifth part, the conclusions and policies involved are presented.

2. Trade and economic growth stylized facts and evidence

The study of the role of trade in economic growth draws back to classical economists such as Adam Smith (1776) who argued that trade benefits nations because it provides a market for the country's surplus. The particularity of Smith (1776) lies in suggesting that trade enhances the benefits of the division of labour and specialisation by expanding the market, that is, it favours to obtain increasing returns in the industry.

Later, David Ricardo (1959) established that trade benefited nations because it allows them to exploit the advantages they have in the production of different goods, i.e., greater relative productivity. In this way, he pointed out that trade was mutually beneficial for the nations participating in it. However, he assumed diminishing returns which limited his analysis of the effects on trade.

Heckscher (1919) and Ohlin (1933), based on a set of restrictive assumptions, or at least inconsistent with later evolution of trade, maintain that trade improves the situation of countries with abundant labour because they specialise in the export of labour-intensive goods, increasing the aggregate income and wages of workers. In turn, capital-abundant countries specialize in capital-intensive goods, raising demand and wages for skilled workers. In this way, trade is mutually beneficial for the participating countries.

In the same sense, Stolper and Samuelson (1941) stated that free international trade leads to the equalisation of the price of the factors of production and thus to the equalisation of the income of the countries. Instead, they maintain that protectionism leads to increased prices and wages of goods protected by the establishment of tariffs, which is associated with low levels of productivity and income.

However, the orthodox approach is questioned by the theory of growth supported by demand. Thirlwall and Pacheco-López (2008) argue that trade liberalisation has not only not reduced the existing wage gap between rich and poor countries but has widened it. First, the wage gap is not reduced because wages depend on productivity and productivity may be higher in rich countries.

Second, wages face downward pressure from exports from other poor developing countries that also produce labour-intensive goods. And third, the entry of foreign investment could demand qualified workers with higher salaries, which could widen the wage gap within the economies receiving this type of investment.

To these three factors mentioned by Thirlwall and Pacheco-López (2008), a fourth can be added, which is the effect of the greater international mobility of capital observed since the first decade of the 2000s, driven by the configuration of the so-called global supply chains. These operate by distributing the production of manufactured goods internationally, although the highest value-added processes remain in developed countries (Rodrik, 2018). Processes that do not require skilled labour, and therefore low salaries, are destined for less developed countries. Furthermore, these economies compete by offering greater advantages to potential investments, such as low-wage labour and tax advantages (Bhaduri, 2003), which deepens the obstacles to improving wages and incomes in these countries.

Among previous factors, the third is the most important and can be explained based on the differences in specialization between developed and developing countries, with formers having a higher degree of industrialization. Authors such as Young (1928), Kaldor (1966,1967,1970) and Verdoorn (1949) explain the key role of industry in economic growth, especially the manufacturing industry. Through the so-called Kaldor-Verdoorn laws, it is established that manufacturing leads to greater productivity and economic growth, due to its increasing returns. And to the extent that manufacturing incorporates workers from lower productivity sectors, it contributes to the increase in total productivity. Once a country manages to obtain the advantage provided by the production of goods with increasing returns, it tends to be maintained (Thirlwall, 2003), which prevents convergence in terms of economic growth.

Thirlwall (2003), from a demand approach, demonstrates that in the long term the economic growth rate of a country (g_t) in relation to that of others (z_t) is given by:

$$\frac{g_t}{z_t} = \frac{\varepsilon}{\pi}$$

where ε : exports income elasticity of demand
π: imports income elasticity of demand

It is this way that productive structure plays an essential role in economic growth, through its influence on the value of the income-demand elasticities of exports and imports. Countries specialized in the production and export of goods with a high-income elasticity of demand will achieve higher growth rates in relation to other countries.

Thirlwall (2003) explains the importance of exports in economic growth because, first, it is the only truly autonomous component of aggregate demand; second, it is the only component of demand that can finance import requirements, and third, because imports that finance exports can be more productive than national resources (particularly capital goods). In this way, the growth of exports relaxes the balance of payments restriction and allows the other components of demand to grow rapidly without incurring balance of payments problems (Ibidem, 2003).

Thus, international trade plays an essential role in economic growth, especially in developing economies, allowing them to overcome the restriction imposed from the balance of payments (Ibidem, 2003). However, opening per se does not achieve higher levels of growth since the presence of an industrialization strategy is required, as has been demonstrated in the cases of Korea and China (Thirlwall and López, 2998). Furthermore, Thirlwall (2003) argues that there is no economy that has reached high development levels in the last century, and that has not resorted to certain degree of protectionism that has allowed them the development of its industry.

3. Trade openness and economic growth

It is questioned whether free trade had been seriously practiced by countries until before the Second World War (Thirlwall and Pacheco-López, 2008). In fact, the first major institution dedicated to promoting trade emerged in the context of the Great Depression of 1929, the General Agreement on Tariffs and Trade (GATT). However, it was not until the 1980s, and especially the 1990s, when the idea that trade liberalization would contribute to economic growth became relevant.

The fall of the Soviet Union in the early nineties of the last century and the hegemony of the capitalist bloc that this entailed created favourable conditions for a broader development of trade. In this context, trade in the European common market deepened, Mercosur was created in South America (1991), North America Trade Agreement in North America (1994), and later the creation of the World Trade Organization (1995). However, a little more than three decades after these processes around the world it is questioned whether trade liberalization has had general positive effects on economic growth.

In the 1980s South Asia had the lowest share of exports to GDP, at just 7 percent, while the European Union and African regions had the highest share levels of exports. However, three decades later, exports tripled their share of GDP in South Asian countries, and grew significantly in East Asia and the Pacific, as well as in the European Union. It is striking that the share of exports in GDP did not increase significantly in African regions, compared to the level they already had in the 1980s, suffering a kind of stagnation process (Table 1).

Table 1. Exports as % of GDP in main world regions 1980-2019

Region	East Asia and Pacific	European Union	Latin America and Caribbean	Sub-Saharan Africa	Africa Eastern and Southern	South Asia	North America
1980-1989	17.4	25.9	N.D.	23.3	24.5	7.0	9.7
1990-1999	19.4	27.9	16.5	23.2	23.9	11.3	11.8
2000-2009	29.6	37.2	23.5	28.3	28.9	17.2	12.4
2010-2019	30.6	45.9	22.2	24.7	26.3	19.9	14.4

Source: own elaboration based on data from World Development Indicators (2024).

In Latin America and the Caribbean, it is observed that exports did not increase significantly between the 1990s and the second decade of the 2000s, and their participation in GDP was lower than in South Asia.

In North America, the share of exports in GDP barely rose from 9.7 to 14.4 percent between 1980 and 2019, highlighting the role of internal market in the greatest developed economy in the world.

Another aspect to highlight is the difference in the composition of exports. According to Thirlwall and Pacheco-López (2008) more than 50 percent of developing countries' export income comes from raw materials, a percentage that increases to 70 percent in the case of Africa. Therefore, its productive structure becomes an obstacle to its growth and limits the role of exports to overcome external sector restrictions.

There is a consensus in economic literature that many developing countries had their best economic performance between 1950 and 1970s (Chang, 2002; Thirlwall, 2003), that is, prior to the trade liberalization processes. From the 1980s onwards, East Asia and the Pacific and South Asia stands out by their notable high growth rates, compared to the rest of the regions, especially Latin America and the Caribbean and the African regions (Table 2). North America and the European Union also had low growth rates. However, they began to deepen their trade opening from higher levels of industrialization.

Table 2. Economic Growth in main world economic regions 1980-2019

Región	East Asia and Pacific	European Union	Latin America and Caribbean	Sub-Saharan Africa	Africa Eastern and Southern	South Asia	North America
1980-1989	5.3	2.3	2.1	1.5	2.6	5.6	3.1
1990-1999	4.3	2.2	2.9	2.1	1.8	5.4	3.1
2000-2009	5.1	1.5	2.8	5.1	4.4	5.9	1.9
2010-2019	5.1	1.6	2.1	3.5	3.0	6.2	2.2

Source: own elaboration based on data from World Development Indicators (2024).

Thirlwall and Pacheco (2008) point out that the difference in the results that trade openness has in some economies is due to the role played by economic policy. In general terms, two factors can be highlighted. First, the transition towards the production of high value-added goods, and second, a certain degree of protectionism that allows the development of domestic industries.

The empirical literature on the relationship between trade openness and economic growth reflects heterogeneity of results. Santos-Paulino and Thirlwall (2004), using the panel data technique for 22 countries in Africa, America, Asia and Europe, find that higher tariffs on exports have a negative effect on growth, and second, that openness has a positive effect if the growth of exports is higher than the growth of imports. That is, it confirms Thirlwall's (2003) statements on the role of exports in economic growth. In the same sense other works find that trade liberalization causes an increase in inequality. However, this is also a function of institutional aspects, as suggested by the results of Gonzalez and Martner (2012).

Cerezo et al. (2021), using panel data for a sample of Latin American, Asian, and European countries, point out that trade deepening has a positive effect in Latin American countries during the period 1990-2019, while the increase in labour costs has a negative effect. In Asian and European countries, total factor productivity and human capital index are significant and have a positive effect on GDP growth. On the other hand, the increase in labour costs has a negative influence. However, it is striking that the variable capturing the effect of international trade deepening is not statistically significant.

Contrasting with these last results, Amna et al. (2020) found a positive effect of liberalisation and human capital on the dynamics of GDP per capita, using data from 19 Asian economies for the period 1985-2017. In the same way, Jošić, H. (2023) found a positive effect of trade on economic growth of OCDE countries during 1988-2020. However, Taiwo et al. (2022) using panel data found a negative impact of trade openness on economic growth in Middle East and North African countries for the period 2003-2017. Lastly, Singh, R. and Aftab, A. (2023) found a reverse causality that goes from economic growth to exports, for the 15 major trading nations during 1996-2018.

According to the heterodox arguments, both theoretical and empirical, questioning the orthodox postulates, four main questions arise: does trade affect the average income of people? Are imports the component of trade that deteriorates the average income of people and individuals? Are the effects of trade different depending on the level of development of the countries in such a way that this generates income divergence between nations? And finally, has the effect of trade on average income varied over time?

These questions were addressed by Thirlwall throughout his work, and he arrive to the conclusion that trade can affect the average income of countries, mainly through imports, and that these effects are greater in lower-income countries, so trade can widen the gap between rich and poor countries (Thirlwall and Pacheco-López, 2008).

In this article we aim to address these questions again using a sample of observations that covers a period of time from the years that began the structural changes towards economic liberalization in many nations until recent years (1980 – 2022), and incorporates a large number of countries (102), from all continents and with varied income levels, in order to test different effects of trade on GDP over time.

4. Methodology

To test the effect of trade on the level of growth and development of a country, represented by GDP per capita, we use a database containing 102 developing and developed countries, distributed across all continents, the sample extends over the period between 1980 and 2022, with annual observations. The data panel is not balanced and has a sample of 2,353 observations.

Trade volume

Two types of models are conducted, the first explores the effect of trade on the dependent variable GDP per capita ($gdppc$) in logarithms, trade is represented as the trade volume ($tradegdp$), which is calculated with the sum of $exports$ and $imports$ of goods and services as a percentage of GDP. The original figures of the variables are given in USD dollars at constant 2015 prices.

This model also includes two control variables that are considered determinants of GDP per capita growth and the level of development of a country, they are incorporated to isolate the effect of trade volume on GDP per capita. The first is a proxy of education represented by the enrolment in tertiary education with respect to the population of age to attend the respective level of schooling ($eduter$), the second is a health proxy expressed by the infant mortality rate per thousand births ($infmor$). Both variables are transformed into logarithms. The source is the World Development Indicators database of the World Bank (2024). The model is presented in equation 1.

$$gdppc_{it} = \alpha + \beta_1 tradegdp_{it} + \beta_2 eduter_{it} + \beta_3 infmor_{it} + u_{it} \quad (1)$$

Equation 1 incorporates an error term (u) that follows white noise assumptions, that is, it is identically and independently distributed with 0 mean and constant variance σ^2, and is represented as $u \sim iid(0, \sigma^2)$. The intercept of the equation or autonomous value of the $gdppc$ is α, the βs are the slopes of the respective variables and the subscripts i, t represent countries and years respectively.

The model is estimated by the ordinary least squares (OLS) method and is known as the pooled data model; the results are presented in column 1 of table 5. The OLS estimation is general in the sense that it does not allow to know the disaggregated effects of trade volume according to classifications by groups of development level of the countries, and it does not control the specific effects of time over the years. Therefore, we added two sets of variables to address the lack of information.

In the first set of variables, the trade volume is disaggregated according to six levels of GDP per capita, through the construction of six interactive dummies, based on the World Bank classification (2024a), as presented in table 3.

Table 3. Classification of countries by income and development levels based on GDP per capita

Number	Leve of income, development	Income range (PIB per capita, constant USD dollars, 2015)	
		Minimum	Maximum
1	Low income		2,560
2	Low & middle income	2,561	5,810
3	Lower middle income	5,811	6,406
4	Middle income	6,407	10,813
5	Upper middle income	10,814	49,606
6	High income	49,607	

Source: (World Bank, 2024a)

The second set of variables comprises dichotomous time dummies (dt) for every year of the sample, from 1980 to 2023, in total there are 63 annual observations. In this way we can obtain the effect of trade on GDP per capita by level of development, through the disaggregation of six slope coefficients ($\beta_1 a\, \beta_6$), and we can also control the time unobservable effects that can change through the years of the sample by estimating a coefficient for each time dummy ($\delta_1\ a\ \delta_{63}$). This model is known as least squares time dummy variables and slope coefficients ($OLSTDVSC$) and is represented by equation 2.

$$gdppc_{it} = \alpha + \sum_{j=1}^{6} \beta_j tradegdp_{it} + \beta_7 eduter_{it} + \beta_8 infmor_{it} + \sum_{k=1}^{63} \delta_j dt_{it} + u_{it} \qquad (2)$$

The coefficients β_7 and β_8 are the estimated slopes of the control variables in education and health respectively, the coefficient α, besides the residual u and the subindices i, t were defined in equation 1.

In order to contrast the simple OLS model of equation 1 with the one that disaggregates trade volume slopes and the time intercepts of equation 2 we report two F tests so as to determine whether the disaggregated variables are more convenient than the aggregated variables. In the first test the null hypothesis is $H01\colon \sum_{j=1}^{6} \beta_j tradegdp\_j_{it} = 0$ and in the second tests it is $H02\colon \sum_{k=1}^{63} \delta_j dt_{it} = 0$.

If the first null hypothesis is not rejected, then it is not convenient to disaggregate the trade volume slope into six categories and a single slope is preferred, that is, there would be no differentiated effects of trade volume on GDP per capita by income level. If the second null hypothesis is not rejected, then there would be no significant time-specific effects.

The $OLSTDVSC$ has some weaknesses; the disaggregation of the time intercept by year incorporates 62-time dummies variables into the model, which reduces degrees of freedom in the estimation and increases the presence of multicollinearity between variables. To solve this situation, an equivalent model called fixed effect (FE) is presented, in which deviations of each observation with respect to the group mean and the mean of all observations are computed. Through this estimation the coefficients of the explanatory variables remain unchanged and, in the case of the time dummy variables coefficients, the average of them is reported. The general form of the FE equation is presented in equation 3.

$$Y_{it} - \bar{\bar{Y}}_i + \bar{\bar{Y}}_{it} = (C_{it} - \bar{\bar{C}}_i + \bar{\bar{C}}_{it}) + (X_{it} - \bar{\bar{X}}_i + \bar{\bar{X}}_{it}) + (u_{it} - u_i + u_{it}) \qquad (3)$$

Where Y is the dependent variable or $gdppc$, C is a vector of time intercepts, it enters the equation as the average of intercepts, X is a vector of explanatory variables that represents the average of group i and the average of the total observations as appropriate. The subscripts i, t and the residual u remain as in the definitions of equation 1. The results of the FE estimation are presented in column 2 of table 5, besides the results of the F tests applied to the $OLSTDVSC$ model.

Additionally, an alternative estimation to the FE model is carried out, in which the heterogeneity between time observations is treated as a random component, and is captured through a compound random error that follows:

$$w_{it} = u_t + e_{it}$$

So that

$$Y_{it} = \alpha_0 + \beta_k X_{kit} + (u_t + e_{it})$$

where u_t is an unobservable random term that represents the component of the residual due to the specific time effect, while e_{it} is the combined error component of time series and cross section. Y is the dependent variable or gdppc, X is the vector of explanatory variables, α_0 is a constant intercept, β is the coefficient vector of the explanatory variables and the subscripts i, t indicate countries and years respectively as they were defined in equation 1.

These so-called random effects (*RE*) model assumes the random component u_t of the composite residual is not correlated with the explanatory variables X_{kit}, that is, $Corr\ (X_{kit}, u_t) = 0$.

To test for the presence of random effects, the Breusch and Pagan Lagrange Multiplier (*BPLM*) test from (1980) is available. The null hypothesis states that the variance of the time-specific effects is equal to zero H0: $s_{ut}^2 = 0$, if the null hypothesis is not rejected then there are no random effects (time-specific effects) and the model is not convenient. The large sample test follows a chi-square distribution with one degree of freedom.

If both models, fixed and random effects, support the presence of time-specific effects, it is necessary to perform a test to determine which of the two is more convenient. In this case the Hausman test (1978) is available. The test compares the coefficients or estimators of both models and is based on the main assumption of the RE model, which states that the specific unobservable random effect of time (u_t) is not correlated with the variables (X_{kit}). The test follows an asymptotic distribution χ^2 with degrees of freedom equal to the number of coefficients X_{kit}. The null hypothesis is built based on the assumption of random effect model $H0$: $Corr\ (X_{kit}, u_t) = 0$.

The idea behind the Hausman test is that the estimators of both models, fixed effects and random effects, are consistent if there is no correlation between the vector of explanatory variables X_{kit} and the u_t component of the residual. Under this idea, the null hypothesis can also be presented as H0: difference in coefficients not systematic. If both models are consistent, they should converge toward the true parameters in long samples, it means that in long samples the fixed and random effects estimators should be similar. In this case, the random effects model is taken to interpret results given that its main assumption is met, although the results of both models are convenient.

On the other hand, if the u_t component of the residual is correlated with any of the variables of the vector X_{kit}, the random effects model estimators are not consistent, while the estimators of the fixed effects model remain consistent. That is, in large samples the *FE* estimators converge toward their true value, but not the *RE* estimators; these coefficients converge toward another value that is not the population value, so a difference is expected to be seen between both estimators. In this case the fixed effects model is preferred. The results of the *RE* model, as well as those of the BPLM and Hausman tests, are presented in column 3 of table 5.

To diagnose the model, a series of additional tests are applied. First, the Breusch–Pagan/Cook–Weisberg heteroscedasticity test (*BP/CW*) is carried out on the residuals of the *OLS* model, under the null hypothesis *H0*: homoscedasticity in the residuals, the result is presented in column 1 of table 5. Homoscedasticity in the *FE* and *RE* models, rather than diagnosing and controlling it, is modelled to quantify unobservable time- and group-specific effects, in the *FE* model through the time dummy variables *TDV* and disaggregated slope coefficients of explanatory variables respectively, and in the RE model through the error component (u_t) and disaggregated slope coefficients respectively. The statistically significance of *TDV* and disaggregated slope coefficients are tested by conducting *F*-tests, while the presence of random effects in the term (u_t) is tested through the BPLM test.

The Jarque-Bera statistic (*JB*) is available in the *OLS, FE* and *RE* estimations to perform a normality test in the residuals under the null *H0*: normality in the residuals. The results are reported in columns 1, 2 and 3 of table 5.

We also conduct unit root tests on the variables, the results are reported in table 4, we find that all the variables, explanatory and dependent, are I(0), except the variable on tertiary education, which is I(1). A cointegration test is reported for every equation of table 5, columns 1 to 4, and they are all cointegrated, suggesting that the variables have a long run relationship in all the estimations.

Table 4. Unit root tests on the variables

Variable	No lags		Lags (1)		Specification
Levels					
gdppc	271.2189	*	307.5451	*	Trend
tradegdp	250.4836	*	246.6397	*	Trend
eduter	171.5534		212.0386		Trend
infmor	347.7256	*	703.4315	*	Trend
exports	207.9343	?	247.4521	*	Trend
Imports	197.4685		246.3703	*	Trend
Differences					
△gdppc	2403.8932	*	1462.6638	*	
△tradegdp	2804.3017	*	1672.3664	*	
△eduter	1418.1929	*	679.6634	*	
△infmor	897.4808	*	572.6724	*	
△exports	2631.5572	*	1540.1044	*	
△imports	2383.0682	*	1603.9497	*	

Notes: * Significant at 1 per cent. ? Significant at 10 per cent.
Source: Own computation with information from World Bank (2024).

To test autocorrelation in the selected static model we perform the modified Bhargava *et al.* (1982) Durbin-Watson test (*MBDW*) and Baltagi-Wu LBI (1999) test (*BWLBI*) under the null hypothesis *H0*: no first order serial correlation. If there is evidence of autocorrelation, then we estimate a dynamic panel data model (*DPDM*) by adding a lagged dependent variable as follows:

$$gdppc_{it}= a_i + g gdppc_{it-1} + \sum_{k=1}^{n} \beta_k X_{kit} + h_i + u_{it} \quad (4)$$

where X is the vector of explanatory variables. The inclusion of a lagged dependent variable incorporates a source of persistence over time: correlation between the right hand regressor $gdppc_{it-1}$ and the error term u_{it}. In addition, *DPDMs* are characterized by individual effects h_i caused by heterogeneity among the individuals. [2] As a result, it is necessary to apply a Generalized Method of Moments (*GMM*) for model 4 on the basis of two standard moment conditions. The first is:

[2] For an elaboration in this point see Baltagi (2001).

$$E\left(gdppc_{i,t-s}\, Du_{it}\right) = 0 \qquad \text{for } t = 3,\ldots,N \text{ and } s \text{ ⍰ } 2$$

the method uses lagged endogenous variables as instruments to control for likely endogeneity of the lagged dependent variable, reflected in the correlation between this variable and the error term in equation 4 transformed in differences. The second is:

$$E[Dgdppc_{it-1}\,(h_i + u_{it})] = 0$$

there is no correlation between lagged differences of $gdppc_{it}$ and the country-specific effects in equation 4 in levels.

The method therefore, uses lagged differences of $gdppc_{it}$ as instruments for equations in levels, in addition to lagged levels of $gdppc_{it}$ as instruments for the equation in first differences. The method is known as the *GMM system* estimation (*GMM-sys*) (Blundell and Bond,1998), it encompasses a regression equation in both differences and levels, each one with its specific set of instrumental variables and improves the properties of the standard first-differenced GMM estimator (Arellano and Bond 1991, Arellano and Bover 1995), since lagged levels of the series provide weak instruments for the first difference (Blundell and Bond,1998), In this sense, we report the GMM-sys in the analysis.

The *GMM* estimations, both difference and system, assume that the disturbances u_{it} are not serially correlated. If this were the case, there should be evidence of first order serial correlation in differenced residuals u_{it} - u_{it-1} and no evidence of second-order serial correlation in the differenced residuals (Doornik *et al*. 2002). It is an important assumption because the consistency of the *GMM* estimator hinges upon the fact that $E[Du_{it}\, Du_{it-2}] = 0$. Consequently, tests of autocorrelation (AB *AC*) up to order 2 or 3 in the first-differenced residuals, proposed by Arellano and Bond (1991) should be available. The *GMM-sys* and the *AB AC* test up to order 3 are reported in column 4 of table 5.

We also perform Granger causality test to verify if there is causality from three groups of variables towards the dependent variable (gdppc), those groups are the time dummy variables, trade, import and export variables, and control variables. The statistic is reported as an F tests, for the selected static equation, the FE, in column 2 of table 5.

Table 5. Trade volume and its effect on GDP per capita

	OLS (1)		FE Slope tradegdp (2)		RE Slope tradegdp (3)		GMM sys (4)	
$gdppc_{t-1}$							1.170	*
$gdppc_{t-2}$							-0.201	*
tradegdp	-0.385	*						
eduter	0.092	*	0.200	*	0.090	*	-0.008	*
infmor	-1.091	*	-0.879	*	-0.806	*	-0.024	*
tradegdp_1			-1.318	*	-2.060	*	-0.058	**
tradegdp_2			-0.680	*	-0.940	*	-0.042	*
tradegdp_3			-0.302	**	-0.548	*	0.076	
tradegdp_4			-0.272	*	-0.510	*	0.186	*

tradegdp_5			-0.346	*	-0.383	*	0.032	**
tradegdp_6			0.333	*	0.350	*	0.021	
^Constant	11.713	*	10.791	*	0.090	*	0.364	*
F slope			(0.000)					
F TDV			(0.000)					
F control variables			(0.000)					
BPLM					(0.982)			
Hausman					(0.000)			
Jarque-Bera	19.11	*	116.10	*	169.70	*		
BP/CW	60.96	*						
MBDW			0.168					
BWLBI			0.417					
Cointegration	218.46	*	212.83	*	217.50	*	1,671.2	*
AB AR1							-5.986	*
AR2							-1.095	
AR3							0.872	
Obs	2,353		2,353		2,353		2,340	

Source: Own computation with information from World Bank (2024)

Notes: * Statistically significant at 99 percent, ** Statistically significant at 95 percent
P-values in parenthesis
^ The constant of the fixed effects models is the average of the time dummy variables

As can be seen in table 5, column 1, in the *OLS* model the trade volume has a negative effect, while as expected, tertiary education enrolment and infant mortality enter the equation with a positive and negative sign respectively. All coefficients are statistically significant at the 99 percent level. In this sense, we can argue that trade volume adversely affects GDP per capita growth across the sample.

When the *OLSTDVSC* model is conducted, all the time intercepts are statistically significant at 99 percent and the coefficients of the disaggregated slopes, for the six levels of development, are statistically significant at 95 and 99 percent. In column 2 of fixed effects of table 5, the respective F tests reject the null hypotheses that the time intercepts and the disaggregated slopes of trade volume are equal to zero. This reflects that the disaggregated *FE* model is more convenient than the simple OLS. Column 3 shows, through the BPLM test, that there are no time random effects, in turn the Hausman test rejects the null hypothesis H0: no systematic differences between *FE* and *RE* as well as the main assumption of random effects $Corr\ (X_{kit}, u_t) = 0$, so the fixed effects model is more convenient, and the results are interpreted based on this.

The effect of trade volume on GDP per capita is positive only in group 6 of countries, the one with the highest income, in contrast from group 5 to group 1 an increasing negative effect tends to occur as the income level of the countries decreases. For every one percentage point upturn in trade volume, GDP per capita rises 0.33 percent in the richest countries, while in the poorest countries it decreases 1.32 percent. That is, the trade volume generates a divergent effect between rich and poor countries in their income level.

A one percent increase in tertiary education enrolment and infant mortality is associated with an upturn in GDP per capita of 0.2 percent and a decrease of 0.88 respectively.

The *JB* test rejects the null *H0*: no normality in the *OLS, FE* and *RE* equations (columns 1 to 3), the *BP/CW* tests of homoscedasticity indicates the presence of heteroskedastic residuals in the *OLS* estimation (column 1), and it is confirmed through the *F* tests and the *BPLM* test in the *FE* and *RE* results (columns 3 and 4 respectively), as both capture unobservable specific effects over the periods. Both the *MBDW* and the *BWLBI* autocorrelation tests, carried out on the residuals of the *FE* estimation are unable to reject the null *H0*: no autocorrelation in the residuals (column 2); hence, we must conduct a *GMM-sys* estimation to control the presence of autocorrelation. The AB AR tests of order 1 to 3 show that in the dynamic equation there is no longer the presence of AC (column 4).

The *F* statistics in column 2 indicate that there is Granger causality from the three groups of variables, time dummy variables, trade volume, imports and exports variables, and control variables towards the dependent variable.

The lagged dependent variables are statistically significant in the *GMM-sys* regression, and the results are in keeping with the static estimates since trade adversely affects the GDP per capita in low-income countries and the effect is mitigated or turns positive as the income level of countries goes up (column 4).

Exports and imports

The second model explores the separate effect of *exports* and *imports* on GDP per capita, the three variables are in logarithms, the source is also the World Bank (2024). The pooled data equation is shown in equation 5.

$$gdppc_{it} = \alpha + \beta_1 exports_{it} + \beta_2 imports_{it} + eduter_{it} + infmor_{it} + u_{it} \qquad (5)$$

In this second model, the control variables are also incorporated to isolate the effect of exports and imports on GDP per capita. The other terms and subscripts of the equation were explained when discussing equation 1. The estimation process to follow is the same as that conducted in the trade volume model, the results are presented in table 6, and they are discussed around the fixed effects estimates, since both the export and the import equations turn out to be the most convenient model, according to the tests reported.

Table 6. Exports and imports and their effect on GDP per capita

	MCO (1)		**FE exports slopes (2)**		**RE exports slopes (3)**		**FE imports slopes (4)**		**RE imports slopes (5)**	
Exports	0.685	*					0.253	*	0.261	*
Imports	-0.570	*	-0.150	*	-0.160	*				
Eduter	0.077	*	0.057	*	0.014		0.058	*	0.015	
Infmor	-0.857	*	-0.471	*	-0.404	*	-0.469	*	-0.402	*
exports_1			0.226	*	0.230	*				
exports_2			0.246	*	0.255	*				
exports_3			0.273	*	0.283	*				

exports_4			0.268	*	0.277	*				
exports_5			0.280	*	0.294	*				
exports_6			0.309	*	0.324	*				
imports_1							-0.178	*	-0.192	*
imports_2							-0.158	*	-0.167	*
imports_3							-0.132	*	-0.139	*
imports_4							-0.136	*	-0.145	*
imports_5							-0.124	*	-0.128	*
imports_6							-0.095	*	-0.097	*
^Constant	8.142	*	7.013	*	6.944	*	7.028	*	6.962	*
F slope			(0.000)				(0.000)			
F TDV			(0.000)				(0.000)			
F control variables			(0.000)				(0.000)			
BPLM					(0.981)				(0.983)	
Hausman					(0.207)				(0.950)	
Jarque-Bera	0.355		12.860	*	11.440	*	13.890	*	11.420	*
BP/CW	1.070									
MBDW			1.716				1.697			
BWLBI			1.831				1.754			
Cointegration	206.847	**	231.269	*	243.837	*	243.293	*	254.134	*
Obs	2,353		2,353		2,353		2.353		2,353	

Source: Own computation with information from World Bank (2024)

Notes: * Statistically significant at 99 percent
P-values in parenthesis
^ The constant of the fixed effects models is the average of the time dummy variables

The export coefficients in column 2 of table 6 are positive, statistically significant at 99 percent, and tend to increase as the level of GDP per capita increases, which demonstrates that the positive effect of exports rises with the level of development of the countries. A one percent increase in exports generates a 0.23 percent and 31 percent increase in GDP per capita in the poorest and the richest countries respectively.

On the contrary, imports are associated with a reduction in GDP per capita in all six groups of countries, but the adverse effect tends to decrease as the level of development rises. All six import coefficients are negative and statistically significant at the 99 percent level. This result indicates that the adverse effect of imports on GDP per capita tends to diminish as the level of development of the countries increases.

The coefficients of the control variables are very similar in the exports and imports equations. A one percent turn up in tertiary education enrolment is associated with an increase of about 0.058 percent in GDP per capita, while a one percent increase in the infant mortality rate is associated with a 0.47 percent drop in GDP per capita. The coefficients of the control variables and those of the time intercepts are statistically significant at 99 percent.

From the results of table 6, we can comment that the negative effect of trade volume on GDP per capita, found in table 5, is produced by imports, in turn both exports and imports generate a divergent effect of GDP per capita between countries, these findings are consistent with previous results (Colla -de-Robertis and Garduno Rivera, 2021; Rodríguez-Pose, A., 2012).

In terms of further diagnostic of the model, we find similar results as those in the trade volume model, absence of normality in the residuals, heteroskedasticity in the residuals, reflected as well in the presence of unobservable time specific effects, and cointegrated equations. Moreover, there exists Granger causality from the three groups of explanatory variables towards the dependent variable. It is worth noting that, once we separate the trade variable into exports and imports, there is no longer autocorrelation in the residual and therefore, it is redundant to perform the *GMM-sys* regression.

Separation of the sample into two periods

To conclude the methodological analysis, we perform a final exercise to split the sample into two periods, the first from 1980 to 2001 and the second from 2002 to 2022.

In the first period, a process of trade liberalization occurred in the 80s and 90s, mainly in developing countries. In most cases, the processes were carried out at the persuasion of the governments themselves, at a time when an economic current of orthodox thought based on free trade prevailed, but also by the condition of promoting liberal policies, imposed by multilateral organizations such as the World Bank and International Monetary Fund, in exchange for obtaining loans (Rodrik,1992).

These loans were required by the countries given that many of them, mainly in Latin America, were in a debt crisis, after having gone through the global oil crisis of the 70s, and the collapse of an import substitution model characterized in its last stages by high public deficits and subsidies to companies and government projects.

After the implementation of trade opening policies, in the 90s and early millennium a series of economic crises arose, generated by high trade deficits, overvalued exchange rates and macroeconomic imbalances among other causes, beginning in 1994 with the crisis in Mexico, and continuing with the crises in Asia in 1997, in Russia in 1998, in Brazil in 1999, and in Argentina in 2001, among others. Consequently, we split the sample into the period from 1980 to 2001 to frame a process of adjustment and structural change followed by a global financial collapse, in economies affected by deliberate economic opening, in a scenario of weak macroeconomic stability policies.

The sample is subdivided into the second period from 2002 to 2022 to frame a process in which multilateral organisations recommended that countries move from a stage that prioritized economic and liberalisation policies to a stage in which a set of socio-political policies were added to the economic prescription, aimed at mitigating adverse effects of economic openness and legitimizing economic liberalization.

Both the trade volume equation and those of exports and imports are estimated with the two samples. Only the results of the *FE* model are presented, because as in the previous estimations, this model proved to be the most convenient.

As can be seen in Table 7, the trade volume coefficients, disaggregated into six country sets, are statistically significant at conventional levels, except in the country set 3 of the first period (column 1). What is striking is that from the first period (column 1) to the second period (column 2), the adverse effect of trade on GDP per capita increases in the country sets from 1 to 5, and a decreasing effect remains as the income level increases. The poorest set of countries (1) changes its coefficient from -0.954 to -1.629, and in the set of countries 5 it changes from -0.294 to -0.386. The country set 6, the richest one, maintains a positive effect of trade on GDP. Then, in the second period of time, characterized by a discourse of socialization and legitimation of trade, the trade volume worsened its effect on GDP, except in the richest countries, and accentuated the divergence between countries.

Table 7. Estimation of the trade volume equation with subsamples applying the *FE* model:

Variables and tests	**Periods**			
	1980-2001 (1)		**2002-2022 (2)**	
tradegdp_1	-0.954	*	-1.629	*
tradegdp_2	-0.578	*	-0.783	*
tradegdp_3	0.141		-0.559	*
tradegdp_4	-0.115	•	-0.412	*
tradegdp_5	-0.294	*	-0.386	*
tradegdp_6	0.435	*	0.309	*
Eduter	0.208	*	0.207	*
Infmor	-0.951	*	-0.792	*
^Constant	11.152	*	10.430	*
F slope	(0.000)		(0.000)	
F TDV	(0.000)		(0.590)	
F control variables	(0.000)		(0.000)	
Jarque-Bera	103.500	*	123.300	*
MBDW	1.593		1.644	
BWLBI	1.728		1.795	
Cointegration	160.141		181.115	
Obs	1,084		1,269	

Source: Own computation with information from World Bank (2024)

Notes: * Statistically significant at 99 percent, • Statistically significant at 99 percent
P-values in parenthesis
^ The constant of the fixed effects models is the average of the time dummy variables

We will now proceed to estimate the equations of exports and imports in both periods, in order to determine which of the two trade components is the most associated with the increase in a negative effect of trade on GDP per capita during the second period.

Table 8 presents the equation where the exports variable is disaggregated. Between the first period (column 1) and the second period (column 2), in each of the country sets, exports reduce their positive impact on GDP per capita, but the reduction is larger in the poorest set of countries (1), and softer in the richest set of countries (6). In the first set the coefficient goes from 0.262 to 0.186, a reduction of 0.08, while in the sixth set the reduction is 0.06, going from 0.330 to 0.278. This is because exports create fewer and fewer jobs in developing countries (Rodrik, 2018).

The magnitude of the coefficients continues to increase in the second period as the income level of the countries increases. All the coefficients are statistically significant at the 99 percent level, except those on the control variables in the second period, which are significant at the 95 percent level.

Table 8. Estimation of the export equation with subsamples applying the *FE* model

Variables and tests	Periods			
	1980-2001 (1)		2002-2022 (2)	
exports_1	0.26169	*	0.185802	*
exports_2	0.273345	*	0.212228	*
exports_3	0.303805	*	0.234226	*
exports_4	0.295392	*	0.233979	*
exports_5	0.305513	*	0.246744	*
exports_6	0.330044	*	0.277881	*
Imports	-0.19155	*	-0.10715	**
Eduter	0.081313	*	0.052931	**
Infmor	-0.57665	*	-0.39779	*
^Constant	7.70062	*	6.569791	*
F slope	(0.000)		(0.000)	
F TDV	(0.000)		(0.999)	
F control variables	(0.000)		(0.000)	
Jarque-Bera	30.770	*	5.831	[illegible]
MBDW				
BWLBI				
Cointegration	188.318		139.074	
Obs	1,084		1,269	

Source: Own computation with information from World Bank (2024)

Notes: * Statistically significant at 99 percent, ** Statistically significant at 95 percent
P-values in parenthesis
^ The constant of the fixed effects models is the average of the time dummy variables

The equation in which imports are disaggregated by the six country sets, across the two periods, is presented in table 9. As can be seen, in the second period (column 2) imports reduce their adverse effect on GDP per capita in all the country sets, compared to the first period (column 1). However, the greatest reduction, by 10 points, occurs in the three sets of the richest countries (4, 5 and 6), while the smallest reduction, by 8 points, occurs in the set of poorest countries (1).

It is worth noting that the coefficient of the import variable of the richest country set (6), in the second period stops being statistically significant, and loses levels of significance in the sets of countries 5 and 4, which suggests that the adverse effect of imports tends to be eliminated over time in rich and middle-income countries, but not in the poorest, this is also a factor in accentuating the income divergence between rich and poor countries over time. The decreasing trend of the adverse effect of imports on GDP per capita as the average income of countries increases continues in the second period.

Table 9. Estimation of the import equation with subsamples applying the *FE* model

Variables and tests	Periods			
	1980-2001 (1)		2002-2022 (2)	
exports	0.284944	*	0.214177	*
imports_1	-0.21552	*	-0.13622	*
imports_2	-0.20387	*	-0.11	*
imports_3	-0.1736	*	-0.08825	**
imports_4	-0.1821	*	-0.08853	**
imports_5	-0.17158	*	-0.07539	•
imports_6	-0.14693	*	-0.04411	
eduter	0.082822	*	0.05152	**
infmor	-0.57401	*	-0.39702	*
^Constant	7.706538	*	6.59658	*
F slope	(0.000)		(0.000)	
F TDV	(0.000)		(0.999)	
F control variables	(0.000)		(0.000)	
Jarque-Bera	32.540	*	6.509	**
MBDW				
BWLBI				
Cointegration	191.004	*	143.163	**
Obs	1,084		1,269	

Source: Own computation with information from World Bank (2024)

Notes: * Statistically significant at 99 percent, ** Statistically significant at 95 percent
P-values in parenthesis
^ The constant of the fixed effects models is the average of the time dummy variables

According to the results of the analysis over two main periods, the trade volume has increased its adverse effect on GDP per capita over time, and this effect has been greater in poor countries, which may lead to greater divergence of income between poor and rich countries. There is evidence that the adverse effect of trade on the average income of countries has grown mainly due to a reduction in the benefits of exports, the reduction has been greater in poor countries. On the other hand, the richest countries over time have managed to eliminate the adverse effect of imports on average income, but not the poorest.

The control variables remain statistically significant at 99 and 95 percent in the three previous tables (6, 7 y 8), the *F* test rejects the null hypothesis that the disaggregated slopes of trade volume, exports and imports are equal to zero. It is important to mention that the *F* test rejects the null hypothesis that the coefficients of the time dummy variables are equal to zero only in the first period, so we can say that the autonomous GDP per capita tends to remain constant throughout the years in the second period.

In the three estimations and in the two periods, the diagnostic of the models presents a similar path: cointegrated equations, the residuals do not follow a normal distribution[3], absence of homoscedasticity in the residuals, which is consistent with the presence of unobservable time specific effects. Furthermore, we find Granger causality from the three groups of explanatory variables towards the dependent variable. It should be added that there is no autocorrelation in the residual and therefore, it is redundant to regress the *GMM-sys* equation.

5. Conclusions

Thirlwall's approach on the role of the external sector in economic growth is among the most important in the last four decades, supported by its extensive theoretical framework that integrates aspects of the work of economists of the stature of Adam Smith and Kaldor. Thirlwall's essential idea is that exports contribute to economic growth because they allow the external restriction to be relaxed, also constituting a factor for the development of the industry. His approach is distinguished by pointing out that economic growth is not an automatic result of trade openness, and an economic policy in favour of the industry is required, which allows the development of the latter. Otherwise, competition from other economies will prevent increases in productivity and wages.

In the econometric estimates for the six groups of countries classified according to their level of per capita income, it is found that contrary to what was expected, total trade, exports plus imports, has a negative effect on per capita income, except for the highest income countries. Furthermore, the negative effect of total trade deepens from the period 1980-2001 to the period 2002 to 2022, except in the group of highest-income countries.

When exports and imports are considered separately, it is found that only the former have a positive effect, and that it increases with the level of their per capita income. However, it is striking that its effect reduces between 1980-2001 and 2002-2022, with reduction being greater in the poorest countries. Furthermore, exports contribute less and less to the economic growth of poor countries. On the contrary, imports are associated with a reduction in GDP per capita in the six groups of countries, which tends to reduce as their level of development increases. However, its effect is reduced from the period 1980-2001 to 2002-2022, and even disappears in the countries included in the highest income groups. Thus, while exports have reduced their positive effect, imports reduce their negative effect, although the former to a greater extent in poor countries, while the latter in rich countries. Thus, trade openness does not contribute to reducing the gap between rich and poor countries, partly explained because lower-income countries have not managed to specialise in the production and export of manufactured goods.

The results lead to the important conclusion that it is a priority to reevaluate the current conditions of trade openness, considering conditions of each country. Note that this does not mean giving up the benefits that international trade represents in terms of expanding demand,

[33] We acknowledge the absence of normality in the residuals of the models, despite conducting four different estimates for almost every model (OLS, FE. RE and GMM sys); in addition, all the estimates are consistent in the results, which is a robustness check for the methodology conducted. Further research should imply how to perform equations with normal residuals or how to quantify the bias, caused in the estimates by the absence of normality in the residuals.

productivity, and external restriction. Instead, it means analysing what specific measures are necessary and feasible to apply in the context of trade agreements and the current reconfiguration of international trade. In the light of econometric results, economic policies in lower- and middle-income countries must be directed to boost and attract export industries with high labour requirements, but also of high economic value added. However, the precise way and degree in which it must be achieved will be a function of the current productive structure and the relevant institutional factors in each country. It also raises the question of how high-income countries respond to these policies, considering the benefits that trade openness has brought them. This also constitutes a potential field of research in the economic area.

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