

ORIGINAL ARTICLE

# **Globalization and Multipliers in the Pacific Alliance Countries: Cases of Peru, Chile and Colombia**

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## **Abstract**

Primary objectives of this work are to discuss the relationship between the level of globalization, the tendencies of import coefficients, and the value of income multipliers in emerging countries in general. The analysis is made via three case studies from The Pacific Alliance countries: Colombia, Peru, and Chile. Statistical results confirm our initial hypothesis of an inverse relationship between globalization and the value of income multipliers. The methodology for calculation of income multipliers is based on the input-output tables of each country for the corresponding years of the analysis.

**Keywords:** Globalization, imports, input-output analysis.

**JEL Code:** F62

## Introduction

The process of globalization of the economy of Peru begins in the 1990s years with Fujimori's government and the new economic program implemented in the early 1990s. After the recession and crisis of the economy in Garcia's government during 1985-1990, in the early 1990s, a program of economic reforms is initiated, oriented to the re-insertion of the Peruvian economy in world markets. This program included financing and macroeconomic stabilization, and market liberalization. (Boloña, 1995).

This process did not imply an immediate re-orientation in all primary extractive sectors, all industries, and all service sectors in Peru. Thus, the productive structure in year 1994 was yet very similar to that of year 1991. For that reason, the 1994 economic census and the 1994 input-output table still reflected a country that was just beginning the process of insertion in global markets. As a consequence, the technical coefficients and other indicators obtained from the 1994 input-output table must be considered as reflecting the starting point of globalization of the country.

On the other hand, the 2007 economic census and the 2007 input-output table already reflect a country that has advanced its globalization process, as all indicators presented in the appropriate reports show (BCRP, 2012; MEF, 2012).

This essay compares the evolution of the multipliers of the Peruvian economy from the 1990s decade (year 1994) and the first decade of the XXI century (year 2007). Two points in time are used, for which we have an original input-output table. This permits the analysis of the multipliers with greater precision.

On the other hand, the globalization process in Chile is initiated at the end of 1980's years (Pinochet's Government) but it really accelerates in the *Concertacion* Governments in the years 1990's and 2000's.

This essay compares the evolution of the multipliers of the Chilean economy from the end of 1980's decade (year 1986) and the first decade of the XXI century, or the years 2000s (year 2003). Again, two points in time are used, for which we have an original input-output table. This permits the analysis of the multipliers with greater precision.

Regarding Colombia, macroeconomic policy in that country has been designed with the aim of taking maximum advantage of the boom of commodity prices in international markets since the 1990s (OCDE, 2013). The globalization of the Colombian economy, adopted in the early 1990s, has propitiated a vigorous economic growth in the years 1990s and the years 2000s. (Melendez & Harker, 2009)

This essay compares the evolution of the multipliers of the Colombian economy for a representative year of the 1990s decade (year 1994) and another representative of the 2000s decade (year 2005). We are conscious that in this case we are not comparing a year of economic globalization with a previous situation before the globalization policy.

## **Research Questions and Hypotheses**

It is important to understand the relationship between the process of globalization of an economy and the degree of productive inter-relations in that economy. It is assumed that the level of globalization is the exogenous variable and the level of linkages among the productive sectors the endogenous variable.

In today's global competitive market, it is critical that providers of a given industry work within free competitive markets in order to assure that input prices be competitive. This, in turn, assures that final products of the industry achieve minimum cost and maximum productivity, for supplying the external markets as well as the domestic market.

The purpose of this quantitative essay is to determine the relationship between the indicators of globalization and the degree of productive linkages of the economy.

Regarding the research questions, The purpose of the study is to make a test of the statistical relation between the indices of globalization and the indices of productive linkages, which are reflected in the level of Keynesian multipliers. Based on theory considerations, the research question is: is there a relationship between globalization and the productive linkages of an economy?

The first hypothesis of this essay is that globalization has an influence on the level of productive linkages. Moreover: (a) since we can measure the degree of globalization through the ratio of imports on GDP; and (b) since we can measure the degree of productive linkages through the multipliers. This, in turn, takes us to the second hypothesis: the ratio of imports on GDP has an influence on the level of multipliers of the economy.

In summary, the hypothesis of this essay is that the globalization process has a direct consequence on the direct and indirect linkages between productive sectors of the economy. Through opening the economy to international trade, the globalization process creates incentives to relatively greater imports of inputs to extractive enterprises, industries, and service enterprises of the economy. In consequence, if import coefficients increase, the linkages between domestic sectors decrease, and the absolute value of the multipliers decreases.

## Theoretical Framework and Methodology

Aggregate multipliers are derived from a simple Keynesian model of income determination (Parkin & Esquivel, 2001; Dornbusch, Fischer, Startz, 1998). The aggregate multiplier represents the final effect of an autonomous increase in final demand (consumption, investment, exports, government expenditures). The final effect must consider the indirect- & -induced effect that the initial expenditure generates. The indirect effect corresponds to the internal demand generated to produce the final goods. The induced effect corresponds to the fact that incomes generated by expansion of production are spent in new final goods which generate new incomes, new consumption and so on.

In the simple Keynesian model, economy's GDP (Y) is estimated as total real expenditure:  $Y=C+I+G+X-M$  where: consumption C, investment I, government G, exports X, and imports M. In the simple model we assume that consumption is a lineal function of disposable income (Y-T) and that imports is a lineal function of GDP (Y). Likewise, investment, government, and exports are known.

In that case, the simple multiplier is estimated by the equation:

$$k = 1 / (1 + m - \beta (1 - t))$$

Where k is the multiplier, m is the import coefficient,  $\beta$  is the marginal propensity to consume, and t is the tax rate (Parkin & Esquivel, 2001).

The simple multiplier model proves that there is an inverse relation between the level of the multiplier (k) and the import coefficient (m). In the mathematical appendix to the multiplier chapter, Parkin & Esquivel conclude that "the multiplier

is larger when ...the marginal propensity to import (m) is lower" (Parkin & Esquivel, 2001, p.289).

On the other hand, the sector multipliers use Leontief input-output model (Chenery & Clark, 1959; Miller & Blair, 1985). The sector multipliers estimate the final effect of an autonomous increase in final demand of each economic sector (input-output sector) on GDP, after considering the direct effect (initial expenditure), the indirect effects (new inputs) and the induced effects (new consumption) that the initial "shock" generates. Thus, for a 55-sector economy, we have 55 different sector multipliers. The matrix models to estimate the sector multipliers are presented in Miller & Blair (1985).

The methodology used here is to estimate the sector multipliers from the Leontief model and then to estimate the aggregate multipliers by aggregating the multipliers at the sector-level. The aggregate multipliers are weighted averages of sector multipliers, the weights being the consumption structure (consumption multiplier) or the investment structure (investment multiplier) or the export structure (exports multiplier).

The objective of aggregate multipliers is to present a general idea of the final impacts of different types of expenditures: consumption, investment, exports. In any case, since these aggregate multipliers are estimated from the sector multipliers, the final results will be more approximate to reality than the multipliers estimated from a macroeconomic model. The formula for calculation of sector multipliers is (Torres Zorrilla,2002):

$$k' = v' (I+M-A-C)^{-1}$$

where k=vector of sector multipliers, v=vector of value-added coefficients, M is import coefficient matrix, A is input-

output coefficients matrix, and C is consumption coefficients matrix. From here we derive the aggregate multiplier of Consumption, Investment, and Exports as the corresponding weighted average of sector multipliers.

## Results

### Multipliers for Peru

The aggregate multipliers for Peru for the years 1994 and 2007 are presented in the following table and in Figure 1. The multipliers are estimated for Consumption, for Investment, and for Exports expenditures. Values of multipliers for year 1994 come from *Instituto Nacional de Estadísticas e Informática (INEI, 2001)*. Values for year 2007 come from a non-publish study (working paper) of the author of this essay, using the input-output table of the Peruvian economy estimated by INEI based on data from the 2007 Economic Census.

Table 1

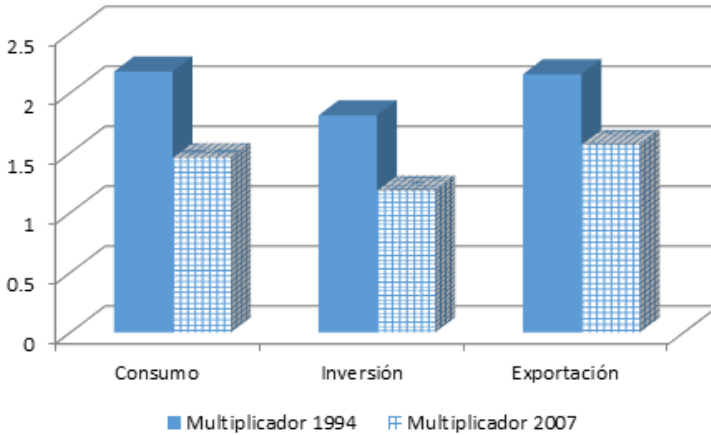
*Aggregate multipliers of Peruvian economy in 1994 and 2007*

	Multiplier 1994	Multiplier 2007
Consumption	2.178	1.456
Investment	1.812	1.183
Exports	2.156	1.566

Source: INEI (2001), Torres (2012)



Figure 1 Aggregate multipliers of Peruvian economy in 1994 and 2007.



Source: INEI (2001), Torres (2012)

Comparing the two columns of Table 1, a first result of the analysis is that the value of the multiplier decreases in 33% for aggregate Consumption, in 35% for aggregate Investment, and in 27% for aggregate Exports, between the year 1994 and year 2007.

## Multipliers for Chile

Regarding Chile, a study by *Banco Central* reports a level of direct-indirect impact above 2, using the 1986 input-output matrix (these impacts must be theoretically less than the income multiplier) (*Banco Central de Chile, 1990*). On the other hand, Yoshioka (2009) report macroeconomic multipliers that, on average, are equal to 1.22 for the period 2006-2008.

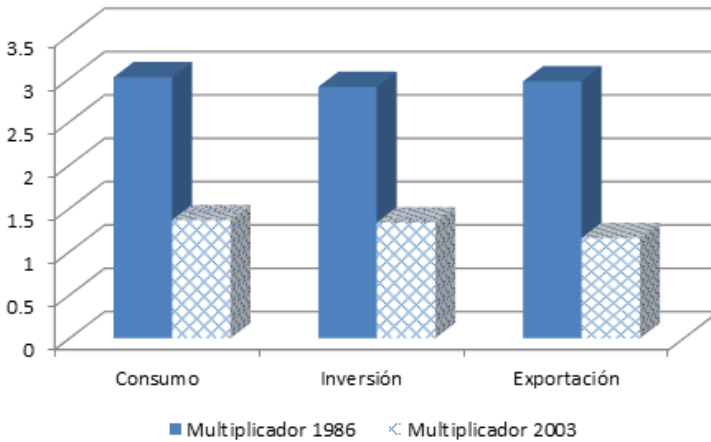
This study makes independent calculations of the Keynesian multipliers for Chile using input-output matrices of 1986 (pre-globalization period) and 2003 (post-globalization period). These calculations use summary matrices of the Chilean economy: an 11 sector matrix for 1986 and a 12-sector matrix for 2003. These matrices have been published by *Banco Central* (*Banco Central Chile, 1992*) and they are available at the internet page *Banco Central* (*Banco Central Chile, 2012*).

Calculations of multipliers for the Chilean economy for years 1986 and 2003 are presented in Table 2 and in Figure 2. Multipliers are presented for consumption, investment, and exports expenditure, to make them comparable with values of Table 1. One result of the analysis is that all multipliers decrease between year 1986 and year 2003. It is clear that the Chilean economy was a closed economy with high multipliers in the 1980s. In contrast, the Chilean economy is more open and globalized in the years 2000's and with low level of multipliers.

Table 2. Aggregate multipliers of Chilean economy in 1986 and 2003

	Multiplier 1986	Multiplier 2003
Consumption	3.013	1.365
Investment	2.901	1.337
Exports	2.966	1.157

Figure 2 Aggregate multipliers of Chilean economy in 1986 and 2003.



The result of the empirical analysis is that the value of multipliers of the Chilean economy decreases in the period 1986 a 2003. The multiplier of Consumption expenditure decreases by 55%, the multiplier of Investment expenditure by 54%, and the multiplier of Exports expenditure by 60%, between the year 1986 and year 2003. These rates of negative growth are inclusive higher than the ones for the Peruvian case, but we should note that the length of period is longer in the case of Chile.

### Multipliers for Colombia

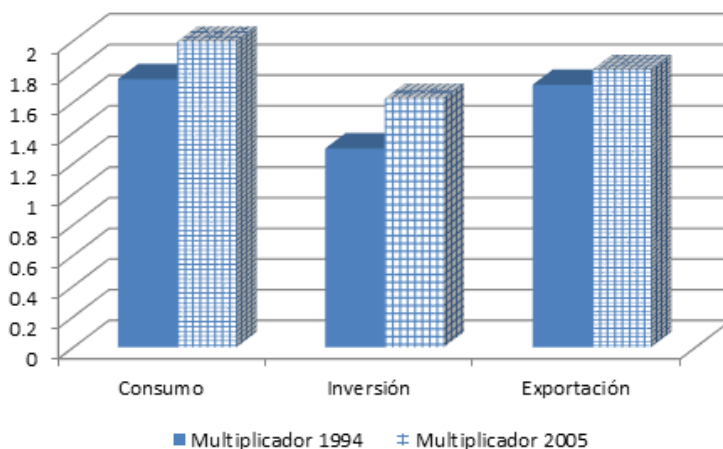
Finally, the situation for Colombia is documented for the years 1994 and 2005, for which we have an estimated official input-output table for the Colombian economy. The calculations of multipliers of the Colombian economy for years 1994 and 2005 are presented in Table 3 and in Figure 3. Aggregate multipliers are presented for consumption, investment, and exports expenditures.

**Table 3.**  
*Aggregate multipliers of Colombian economy in 1994 and 2005*

	Multiplier 1994	Multiplier 2005
Consumption	1.750	1.994
Investment	1.298	1.621
Exports	1.713	1.809

Source: DANE (2009)

*Figure 3 Aggregate multipliers of Colombian economy in 1994 and 2005.*



In the Colombian case, the result of the analysis is that the multipliers are lower (or similar) in year 2005 with respect to year 1994. This is a different result as compared to the two previous cases of Peru and Chile. The consumption multiplier is higher by 13%, and the exports multiplier is higher by 5%. But the investment multiplier is the one that grows significantly from 1.298 to 1.621, by 25%.

Explaining this different result for the Colombian case involves recognizing that, as was already mentioned, the Colombian economy was already globalized in the initial year 1994 as well as in the final year of the analysis, in the year 2005. In the following section we go deeper in the analysis when we compare the level of multipliers with the import ratios for the three economies.

### Globalization and Foreign Trade Ratios

The results for Peru would be consistent with the theoretical framework of a previous section if we prove that the ratio imports/GDP has increased between year 1994 and year 2007. Table 4 presents a comparison of the ratio imports/GDP for years 1994 and 2007 of the Peruvian economy. Likewise, we present the ratio imports/GDP of Chile and Colombia for the corresponding years of their respective input-output tables.

Table 4 : *Imports as a percent of GDP: Peru, Chile and Colombia*

Year	Peru	Year	Chile	Year	Colombia
1994	16	1986	26	1994	21
2007	22	2003	31	2005	19

Source: World Bank (2013), BCR (2013)

Another result of the analysis for Peru is that the ratio of imports grows significantly and it increases from 16% in 1994 to 22% in year 2007. This means that the ratio, as a percent of GDP, is multiplied by 1.4 in the period.

Table 4 confirms our initial hypothesis that relates import ratios with the multipliers. Globalization of the Peruvian economy from year 1994 to year 2007 has meant that participation of

imports as a percent of GDP increases significantly. This explains that the multipliers decrease, because, as it is derived from the theoretical analysis, the aggregate multiplier will be lower when the marginal propensity to import is higher. Additionally, the growth of trade is even higher for Peruvian exports, that is, the effect of globalization is reflected even more in the ratio exports/GDP (BCR, 2013).

The results for Chile are also consistent with the theoretical framework because we prove that the imports/GDP ratio has increased between year 1986 and year 2003 from 26% to 31% (see Table 4).

The results for Colombia are somewhat different because multipliers for Colombia actually increase between year 1994 and year 2005 (see Table 4). However, since ratio of imports decrease from 21 in 1994 to 19 in 2005, we can say that the results for Colombia are also consistent with the theoretical framework. In this case the argument is that if import coefficients decrease, the linkages among domestic sectors will increase, and in consequence, the absolute value of multipliers will increase.

Globalization of the economy is not a phenomenon limited to Peru, Colombia and Chile. It may be also observed in other neighbor countries, such as Ecuador. A comparison of the evolution of the imports ratio for Peru, Colombia, Chile and Ecuador, in the long-run, is presented in Table 5.

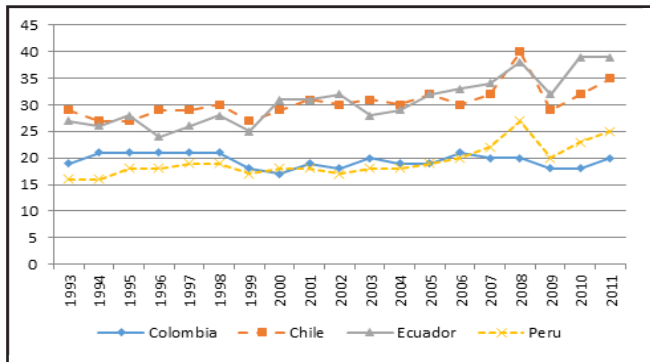
The World Bank presents these statistics of the ratio of imports of goods and services as a % of GDP for all countries of the world (World Bank, 2013). Table 5 presents the ratio imports/GDP of four south-American countries for period 1993-2011. These statistics are also shown in Figure 4.

*Table 5. Imports as a percent of GDP in selected countries.*

Year	Colombia	Chile	Ecuador	Peru
1993	19	29	27	16
1994	21	27	26	16
1995	21	27	28	18
1996	21	29	24	18
1997	21	29	26	19
1998	21	30	28	19
1999	18	27	25	17
2000	17	29	31	18
2001	19	31	31	18
2002	18	30	32	17
2003	20	31	28	18
2004	19	30	29	18
2005	19	32	32	19
2006	21	30	33	20
2007	20	32	34	22
2008	20	40	38	27
2009	18	29	32	20
2010	18	32	39	23
2011	20	35	39	25

Source: World Bank (2013)

*Figure 4. Imports as a percent of GDP in selected countries.*



Source: World Bank (2013)

Figure 4 shows an increase of the ratio imports/GDP in period 1993-2011 for Ecuador, Chile, and Peru. Only for Colombia this ratio stays around 20% in the whole period. The explanation could be that Colombia was already inserted and globalized in world trade since before the 1990s.

As a consequence, we may expect that multipliers of Peru, Chile, and Ecuador had diminished in the period from the 1990s to the 2000s. This is derived from the theoretical analysis of the multiplier above, where we show that the multiplier will be lower when the marginal propensity to import is higher.

## Conclusions

The hypothesis of this essay is that the process of globalization has as a consequence, in general, that import coefficients increase, that linkages between domestic sectors diminish, and that the absolute value of the multipliers decrease.

A first conclusion of the analysis is that the multipliers of the Peruvian economy and the Chilean economy decreased in period 1990s-2000s. For Peru, the multiplier decreases in 33% for Consumption, in 35% for Investment, and in 27% for Exports, between the year 1994 and year 2007. For Chile, multiplier of Consumption decreases by 55%, multiplier of Investment by 54%, and multiplier of Exports by 60%, between the year 1986 and year 2003.

Only for Colombia multipliers are lower (or similar) in year 2005 with respect to year 1994. Consumption multiplier is greater by 13% and exports multiplier is greater by 5%. Investment multiplier increases significantly from by 25%. This is clearly a different result as compared to the previous cases of Peru and Chile.



A second conclusion of the analysis is that the imports/GDP ratio grows very significantly for Peru, increasing from 16% in 1994 to 22% in year 2007. This confirms our initial hypothesis that globalization has meant that participation of imports in GDP grows which, in turn, explains multipliers decreasing. For Chile, the analysis shows an increase in the imports/GDP ratio in the period, particularly from 26% in 1986 to 31% in 2003. As a consequence, we should expect that Chilean multipliers decrease over the period. The result of the empirical analysis is that value of multipliers of Chilean economy decreased in period 1986-2003.

Only for Colombia the imports/GDP ratio decreases or stays the same. This explains the results of the empirical analysis: the multipliers are higher in year 2005 with respect to 1994. Again, this is a different result as compared to the previous cases of Peru and Chile; however, this result is explained by the evolution of the import ratio.

Additionally, we must comment that income multipliers, in this paper, only represent the direct-indirect-induced impacts of an exogenous increase in final demand for each economy (for instance, in Colombia). What we should expect to derive should be the direct-indirect-induced impacts for the three countries of the region under study (Pacific Alliance in this case). Only then we can deduct the benefits of economic integration for these countries; this is proposed as a future study.

Finally, there are other factors that influence the income multipliers (apart from import ratios). This becomes evident from the matrix formula (page 6) that shows the other factors: (a) sectoral linkages, included in the input-output coefficient matrix A; and (b) marginal propensity to consume or the  $\beta$  coefficients included in matrix C. These two factors should be considered in future studies.

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