

Latin America and the international economic crisis: the trade channel.

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Resumen

Esta investigación propone una vía para la evaluación del impacto de corto plazo que la crisis financiera y económica internacional, transmitida esencialmente a través del canal comercial, puede tener sobre un conjunto de ocho economías latinoamericanas. Para el efecto se emplea un modelo del sector real, el modelo GTAP, caracterizado por ser de alcance global y operar bajo el supuesto de retornos constantes a escala. La estrategia de modelación se basa en la implementación de un choque negativo a la dotación de capital de las economías de Estados Unidos y la Unión Europea, de forma tal que se genere un decrecimiento del PIB similar al pronosticado para 2009 por el FMI. Los principales resultados muestran un esperado y generalizado efecto negativo sobre el PIB. Sin embargo, su intensidad no necesariamente depende del grado de dependencia comercial de las economías con respecto a Estados Unidos y la Unión Europea. La composición sectorial del comercio tiene importancia. Otro tanto sucede con el comportamiento de los precios internacionales. A pesar de que el impacto de la crisis sobre el valor de los flujos comerciales luce relativamente moderado, la caída del PIB tiende a ser mayor y no es desdeñable. No obstante, cuando el impacto se mide en términos de bienestar resulta ser más bien moderado.

Palabras clave: comercio internacional, la crisis mundial, Colombia, de equilibrio general computable.

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Abstract

This research proposes an avenue for assessing the short run impact of the financial and economic crisis on a set of eight Latin American economies, as it is transmitted along the trade channel. For this a real sector model is used, the multiregion, constant returns to scale, computable general equilibrium GTAP model. The modeling strategy is based on implementing a negative shock to the capital stock of the US and EU's economies, in such a way that the resulting behavior of the value of GDP is close to that forecasted for 2009 by the IMF. The main results show a generalized expected negative impact on GDP. However, its extent not necessarily depends on the degree of trade dependence of the economies with respect to the US and EU's economies. Trade composition, in terms of the export and import portfolio, matters. The same is true as it refers to price changes. Even though the impact on the value of trade flows looks relatively moderate, the drop in the value of GDP tends to be larger and is not negligible. In spite of this, when the impact is measured in terms of welfare it turns out that it could be moderate.

Key words: International trade, Global crisis, Colombia, Computable General Equilibrium

Resumo

Esta pesquisa propõe uma via para a avaliação do impacto de curto prazo que a crise financeira e econômica internacional, transmitida essencialmente a través do canal comercial, pode ter sobre um conjunto de oito economias latino-americanas. Com esse propósito emprega-se um modelo do setor real, o modelo GTAP, caracterizado por ser de alcance global e operar sob a suposição de retornos constantes a escala. A estratégia de modelação baseia-se na implantação de um choque negativo à dotação de capital das economias dos Estados Unidos e a União Européia, de forma tal que se gere um decréscimo do PIB similar ao prognosticado para o 2009 pelo FMI. Os principais resultados mostram um esperado e generalizado efeito negativo sobre o PIB. Porém, a sua intensidade não necessariamente depende do grau de dependência comercial das economias ao respeito dos Estados Unidos e a União Européia. A composição setorial do comercio tem importância. Outro tanto acontece com o comportamento dos preços internacionais. A pesar de que o impacto da crise sobre o valor dos fluxos comerciais aparece como relativamente moderado, a queda do PIB tende a ser maior e não é desdenhável. Porém, quando o impacto se mede em termos de bem-estar resulta ser bem mais moderado.

Palavras chaves: econômica internacional, crise financeira

JEL: F13, F15, F17

1. Introduction

The current global financial and economic crisis put a halt on recent economic growth and endangers achievements in poverty reduction worldwide. World output is expected to shrink 1.4 per cent in 2009 (IMF, 2009) and start weakly recovering in 2010 (2.5 per cent positive growth). The slump will affect the most the developed nations (-3.8 per cent) while emerging and developing economies are expected to attain low but positive growth (1.5 per cent). However, Western Hemisphere economies are forecasted to lose output (-2.6 per cent), especially Mexico whose GDP is expected to fall by 7.3 per cent. World trade volume (goods and services) are expected to decrease by 12.2 per cent.

Started as a financial crisis, it quickly developed as a real sector crisis affecting first the economies of the United States and the European Union and then spreading to most countries. Economies most closely linked to the international financial system will suffer the most, as credit becomes scarce. Yet, economies with looser ties to international finance will be negatively affected mainly through four types of transmission channels: international trade, capital flows and investment, remittances, and international aid.

As the US and the EU dip into recession, the world economy losses two of the main drivers of international trade. A recently released report by the OECD (2009), shows that G-7 countries trade is decreasing at a fast pace. Exports volume fell 13.6 per cent in the first quarter of 2009 while imports volume decrease by 10.5 per cent (the corresponding annualized rates are -22.8 per cent and -16.8).

The figures in terms of values are equally worrisome. Exports value decreased 13.4 per cent in the first quarter of 2009, while imports value decreased 15.2 per cent (the annualized rates are 27.1 and 27.9 per cent, respectively). The financial component of the crisis, compounded by exchange volatility, has sent international capital flows in disarray, while several major investment projects have been called off. According to the World Bank (2009), the pace of remittances decreased sharply starting in the third quarter of 2008 as the crisis took root in the countries where migrants workers have their jobs and their total volume is expected to markedly decrease during 2009. The problem of indebtedness and the instability of fiscal policy in industrialized countries could negatively affect development aid and donor countries' commitments to contribute 0.7 percent of their GDP to developing countries.

While it is clear that none of these transmission channels operates in isolation, it is useful and illustrative for analytical and policy reasons to attempt to assess the likely impact of the crisis through these channels. The objective of this paper is to provide an avenue for appraising the short run effects of the current crisis as it is transmitted through the trade channel, on several Latin American economies. A real sector model (a global computable general equilibrium model) is employed for this end.

The modeling strategy can be broadly described as follows. A negative shock is applied to the US and EU economies in such a way that it yields as a result a decline in the value of GDP similar to the one that has been forecasted for these economies by the most recent estimate issued by the IMF (2009). The

shrinkage of these economies is transmitted to the rest of the world mainly through the trade channel. As the different forms of demand decline, the economy demands less goods and services from both domestic and foreign origin. Therefore, production decreases lowering supply for domestic consumption as well as exports. This means that the rest of the world will be supplying less goods to these economies while, possibly, buying less from them.

The main results indicate that the effects of the global crisis on the selected Latin American economies, as transmitted through the trade channel, are expected to be negative. However, their extent not necessarily depends on their degree of trade dependence with respect to the US and EU's economies. Trade composition, in terms of the export and import portfolio, matters. The same is true as it refers to price changes. Even though the impact on the value of trade flows (exports and imports) looks moderate, the drop in the value of GDP tends to be larger and is not negligible. In spite of this, when the impact is measured in terms of welfare it turns out that it is quite moderate (a consequence of lower world and domestic prices).

The paper is organized as follows. Section two provides some background on the crisis. Section three states the objective of this research and presents the modeling strategy. Section four discusses the model structure regarding the areas of interest for the objective proposed and describes the scenarios simulated. Section five presents and discusses the results. Lastly, section six concludes.

2. Background on the Global Economic Crisis

The current global financial and economic crisis is the most serious threat that the world has faced in over half a century. According to Eichengreen and O'Rourke (2009) world industrial production, trade, and stock markets are going down faster than in 1929-1930. In its July 2009 update of the World Economic Outlook, the International Monetary Fund (IMF) forecasted 1.4 percent negative growth for the global economy during the current year (a 0.1 percent deterioration over its April update). The severity of the crisis is readily appreciated if one considers that the corresponding figure for the IMF's January forecast was a positive 0.5 percent and that global growth recorded 5.1 percentage points in 2007 and 3.1 percentage points in 2008.

The global economy is expected to gradually return to positive growth in 2010 (the IMF forecasts 2.5 percent growth), thanks to numerous monetary and fiscal stimulus programs in developed and developing countries. However, it is generally agreed that recovery will likely be sluggish (IMF, 2009) and that the crisis will have a significant impact on poverty reduction in spite that developing countries are expected to experience lower growth decline (Chen and Ravallion, 2009).

It is accepted that the global financial and economic crisis originated in the 2006 mortgage crisis in the United States. That crisis was itself seeded by both the United States (US) Federal Reserve and inadequate practices among financial institutions and intermediaries. Its origin can be traced back to expansionist monetary policy earlier in the

decade that drove US interest rates to very low levels, coupled with risky banking practices among financial institutions, leading to what has been known as “subprime” mortgages. The subsequent process of converting subprime debt into complex financial products (including asset-backed commercial paper) via securities markets, together with liquidity inflows in search of attractive investments, internationalized the bad (subprime) credit.

The mortgage crisis began to unravel in 2006 when the Fed introduced a sequence of major increases to the interest rate.¹ Following, the “mortgage crisis” spread affecting first American financial institutions all across the board and then European ones in the second quarter of 2007. The global “financial crisis” was then born and the subsequent loss of confidence took hold at the global level, giving rise to what has been termed the “confidence crisis” that hit the real economy in the autumn of 2008, transforming the “financial crisis” into a global “economic crisis.”

“Financial contagion” across international financial markets was the main channel through which the crisis transmitted to industrialized and emerging economies. Relatively weak integration into the global financial system seemed to shelter most developing countries from the effects of the crisis. However, as it has become more of a real sector crisis, for most developing countries this may be characterized mainly as a “trade crisis” (Evennet and Hoekman, 2009). Trade is expected to shrink by 10% in 2009,

the worst decline since the Great Depression. According to Freund (2009), in the first quarter of 2009 global nominal trade fell by 30% on average relative to the same period last year. A decrease attributable partly to a massive decline in final demand and a shortage of trade credit (Baldwin and Evennet, 2009).

Nevertheless, the decline in final demand and the trade credit crunch alone do not seem to explain neither the sudden collapse of trade nor that trade contraction has been rather asymmetric and that this asymmetry does not seem to be correlated with exposure to the crisis. This is due to the fact that income (GDP) is a net measure (value added) while trade is a gross measure. An increase in GDP, linked to greater outsourcing, will lead to a greater increase in trade as materials and parts travel along the globe back and forth before getting to the final consumer. In fact, Irwin (2002) and Freund (2009) find that the elasticity of real world trade to real world income has been increasing from about 2 in the 1960’s to near 3.7 in the 2000’s; an increase that may be due to the international fragmentation of production (Yi, 2008) and to vertical foreign direct investment (Tanaka, 2009).

The macroeconomic impacts and the distributive effects of the economic crisis in developing countries will largely depend on the magnitude and length of the recession in developed countries, the main transmission channels applying in each case, the initial conditions in each country, and the macroeconomic policies they implement to respond to the crisis. The main transmission channels delivering the effects of the crisis from the global level to the national economies level are, for developing countries, trade, capital flows

¹ From 1 percent in June 2004, the Fed’s headline interest rate rose to 5.25 percent in June 2006 (The Reserve Federal Board, <http://www.federalreserve.gov/fomc/fundsrate.htm>; April 24, 2009).

and investment, remittances, and international aid. In this research I only focus on the trade channel.

External trade experienced a 9.3 percent annual growth rate over the first half of the 2000's, more than double the 3.8 percent rate of growth for global economic production (Decaluwe and Flores, 2009). External trade in goods and services is an important component of developing economies, particularly those

in sub-Saharan Africa (SSA), the Middle East and North Africa (MENA), and South America (SA). This can be appreciated in Table 1 where it is also shown that trade dependency (openness) for some developing countries and the rest of the world is large.² As these economies have profited from global economic growth, they have also increased their exposure and vulnerability to external economic shocks.

Table 1. Trade structure by region (percent)

Region	Import share	Export share	Ratio export to import	Openness
Sub-Saharan Africa	1.1	1.0	92.0	67.6
Middle East and North Africa	3.8	3.9	104.4	60.1
Asia	17.1	19.5	113.7	43.4
South America	2.5	2.6	104.0	30.9
China	3.9	5.6	141.5	56.3
India	0.9	0.9	102.5	25.3
Russia	1.7	2.2	127.3	65.7
North America	23.8	19.1	80.4	25.9
European Union 27	39.2	39.0	99.5	64.9
Rest of the World	6.0	6.2	103.2	61.0
All	100.0	100.0	100.0	44.2

Taken from Decaluwe and Flores (2009)

The slowdown in global economic growth will affect the volumes and prices of traded products. The IMF (2009) predicts a 12.2 percent decline in world trade volume (goods and services) for 2009. In the case of imports, for advanced economies the figure is -13.6 per cent, while the corresponding to emerging and developing economies is -9.6 percent. In the case of exports, the figures are -15 percent for advanced economies and -6.5 percent for emerging and developing economies.

There is considerable uncertainty as to the expected behavior of international prices. From June 2008 to December 2008, the IMF's Index of Primary Commodity Prices fell from around 220 in nominal terms (about 195 in real terms) to slightly below 100 (90 in real terms). Without oil, the figures are around 170 (150 in real terms) and 110 (100 in real terms).

² Trade openness is measured as the ratio of external exchange (imports and exports) of goods and services and GDP.

Since then, and up to Jun 2009, commodity prices have risen to near 130 (around 117 in real terms) including oil and to comparable levels not including it. It has been suggested that the developing countries more at risk are those maintaining close trade relations with the industrialized countries in recession and also those who are dependent on high income-elasticity products (for example, the tourism sector in the Caribbean and many African countries) and on exports of products where world prices have fallen the most (for example, copper in Zambia). Consequently, the impact of the crisis on developing countries should be directly related to the trade profile – the structure of imports and exports – of each country.

According to Decaluwe and Flores (2009), countries that export manufactures and services can expect a decline in the volume of their transactions, whereas exporters of primary mineral materials would face a drop in international prices. However, there are no clear cut rules for anticipating the trade effects arising from the crisis. For instance, while SSA and MENA may be hurt by deteriorating international trade in agricultural products and natural resources, they benefit from falling prices for non food manufactured goods and services (at a cost to Asia) and for food (to the disadvantage of Latin America). Countries with an external current account deficit will face strong pressures on their exchange and inflation rates. Also, terms of trade effects arising from the crisis will be important in determining its outcome on developing countries.

As follows from above, casual observation of the effects of the global crisis on developing countries pinpoints to several factors and stylized facts that help envision

their size and extent. However, the only way to appraise the impact of the crisis is through empirical research that allows for estimating the likely effects of the several components and transmission channels involved. In the following, a strategy is proposed for assessing the impacts arising from the trade channel and its results are discussed.

3. Objective and Modeling Strategy

As follows from the above, the crisis (that started as a financial one) has become a real sector crisis. While it is true that none of the transmission channels briefly depicted operates in isolation, it is useful and illustrative for analytical and policy reasons to attempt to assess the likely impact of the crisis through these channels. The objective of this paper is to provide an approximation to such an assessment for the trade channel for several Latin American economies, with a short run perspective (i.e. to the likely trade impacts from the 2009 projected slump of the US and EU's GDP).

A real sector model is employed for this end. I make use of the standard GTAP model, a static, decreasing returns, multiregion, general equilibrium model widely used for trade and other global phenomena analysis. The model is described in detail in the GTAP web page³. The modeling strategy can be broadly described as follows. A shock, detailed ahead, is applied to the US and EU economies in such a way that it yields as a result a decline in the value of GDP

³ <https://www.gtap.agecon.purdue.edu/>

similar to the one that has been forecasted for these economies by the most recent estimate issued by the IMF (2009). The shrinkage of these economies is transmitted to the rest of the world mainly through the trade channel. As the different forms of demand decline, the economy demands less goods and services from both domestic and foreign origin. Therefore, production decreases lowering supply for domestic consumption as well as exports. This means that the rest of the world will be supplying less goods to these economies while, possibly, buying less from them (due basically to lower supply).

Dixon et al (2009) portrait the credit crisis as having an effect similar to that of a sales tax. In a credit crisis, households and firms that can normally obtain credit to conduct transactions find out that they no longer have access to it. Therefore, a credit crisis inhibits economic transactions in much the same way that a sales tax would do. Their modeling strategy (with a real sector dynamic model) is thus to implement a “phantom” sales tax on transactions in which credit is important (like durables purchases by households and firms inputs for capital creation) in such a way that economic activity is hindered consistently with OECD’s forecasts for GDP. Of course, no tax revenue is collected by the government and no taxes are actually paid for by firms and households (all tax revenue is given back to firms and households as a lump sum). The tax is just a device for lowering purchases of the relevant goods and services.

Results obtained by these authors and consideration of the actual behavior of the US currency and foreign trade, left them with the need to conduct a simulation in which

there is a sharp reduction in investment but no real depreciation (and hence no positive and strong trade response). This led the authors to explore several alternative ways of modeling the crisis, among them a contraction in world demand for US exports and excess capacity. In the first modeling exercise (Dixon et al, 2009) the authors thought that excess capacity was adequately represented by the shift in the capital-labor ratio that occurs as a consequence of lower labor supply in the face of fixed capital at the industry level. As it turns out, this assumption would lead to high capital returns decreases that inevitable generate currency depreciation (and a rebound in trade). Therefore, the authors fix the model to explicitly introduce excess capacity by means of sticky adjustment of capital rent rates (Dixon and Rimmer, 2009).

As I am interested in the short run effects of the crisis and make use of a static model, I draw on Dixon and Rimmer’s (2009) intuition as well as on Clark et al (2008) to model the impact of the crisis on the US and EU economies as a negative shock to the capital endowment of these economies. The procedure is akin to having a certain level of excess capacity without leading to a decrease in the capital rental rate, avoiding an unrealistic effect on international trade.

On the other hand, there is need to model labor markets (for both skilled and unskilled labor) as featuring fixed wages while the number of workers adjusts to clear the market. This way, the main characteristics of the short run development of the crisis are captured: excess capacity, unemployment, and sticky wages. Admittedly, the approach used here lacks the detail (and differentiated effects) that the Dixon

et al (2009) approach has. However, as the path along which the economy recovers is of no importance for our objective, I believe this to be an acceptable limitation.

4. Model Structure and Scenarios

Before moving to describe the scenarios that are implemented, it is convenient to discuss a couple of features of the GTAP model that impinge upon the results. There are two ways in which the economies embodied in the model interact. The first is international trade. The second is global savings and investment.

As in most trade models, trade is modeled based on the Armington assumption (i.e. traded goods are differentiated by their country of origin). This is typically handled by means of Constant Elasticity of Demand (CES) functions. Therefore, agents source imports independently of the price of domestic like products. This separability in demand implies that each source region has some market power, since its product is only imperfectly substituted for by products originated in other regions.

According to Zhang (2008), there are two well known drawbacks common to Armington models. First, they tend to yield larger than expected changes in inter-country relative prices (i.e. result in relatively large terms of trade effects), especially for small countries (as their export demand elasticities depend mainly on the Armington elasticity in the importing country, whereas export demand elasticities for large countries are affected by market share). Second, they tend to yield smaller than expected changes in inter-industry relative prices and, therefore, in national output

(possibly underestimating gains from allocative efficiency).

The general equilibrium properties of an Armington model are controlled through the choosing of an “appropriate” Armington elasticity value. It has to be set above one to avoid “abnormal” behavior in the model, since a lower than unity value implies that consumers regard country of origin differentiated products as gross complements. However, high elasticity values would be inconsistent with products of different origin being dissimilar.

Hence, in an Armington model trade shifts from one supplier to the other are determined by the Armington elasticity. This is critical when a shock implies changes in market access conditions. However, in a situation as the one we have at hand (where there are no such changes) the above mentioned shortcomings of the model seem to be less severe, but it is likely that some underestimation of trade flows changes takes place.

Regarding savings and investment we have the following. Because the global economy is closed, Walras Law implies that global income must equal global expenditure or that global savings must equal global investment. However, global savings is just the aggregation of regional savings and, therefore, it is determined by them. Being a static model, there is no explicit intertemporal optimization and regional savings are determined by constrained static optimization. Savings is an argument in the regional household utility function and constrained optimization leads to a demand for a homogeneous savings good. As in the case of any other good, demand for savings depends on the income level of the regional household and on the relative price of the savings good.

The savings good is supplied by a global bank. The global bank is just a device for aggregating savings from and for allocating investment to the regions. The bank sells a homogenous savings good to each region and buys shares in a portfolio of regional investment. Once the bank has collected all regional savings, there are two possible ways in which it allocates investment.

One follows the “fixed regional composition” criterion. That is, investment is allocated to regions in such a way that the regional composition of global capital stocks does not change. In this case, regional and global net investment (regional investment minus depreciation) move together and rates of return will differ among regions (while the global rate of return will just be a weighted average of regional rates of return).

The second is based upon the idea that there is a competitive allocation of investment across regions and, therefore, expected returns are uniform globally. In this case, investment depends on the “expected” rate of return and this, in turn, inversely on the capital stock. Global investment is allocated so that changes in the expected rate of return are equalized across regions and the global rate of return changes by the same percentage.

With the closure I use here, global investment is savings driven. That is, the global bank adjusts global investment to meet any change in global savings. However, it should be noticed that although there is balancing at the global level, this is not necessarily so at the regional level since regional economies are open. The regional budget constraint implies that expenditures must equal income or, simpler, that the difference between savings and

investment must equal the difference between exports and imports.

From the above, it follows that there may be implications on changes in trade flows arising from the particular way it is assumed that the global economy reaches the savings-investment equilibrium. While the representation of savings-investment flows in the model is not “realistic”, the two alternatives provide plausible scenarios and it becomes advisable to observe estimated trade impacts arising from the crisis under both.

Lastly, it is important to notice that I use a general equilibrium closure, allowing for full adjustment of the economy. This rule is broken in the case of the US and the EU in that, as mentioned, labor markets clear through employment levels rather than wage levels. For regions of interest other than these two⁴, I make consideration of an alternative closure that fixes the relative trade balance (i.e. the ratio of the current account to GDP). This allows, in the case of a competitive allocation of investment across regions, to avoid the “free lunch” effect that can arise from potentially high foreign capital inflows. However, it must be noticed that the existence of a global bank controls this effect to a large extent.

As follows from these considerations, the scenarios that are simulated in this research share a common feature: capital endowments for the US and the EU are negatively shocked in such a way as to attain drops in the value of GDP close to forecasted levels. Beyond this, the first scenario considers that global investment is allocated on a competitive basis, the

⁴ This feature is enabled for Mexico, Argentina, Brasil, Chile, Colombia, Ecuador, Peru, and Venezuela.

second scenario that global investment is allocated following the fixed regional composition assumption, and the third scenario considers that global savings are allocated on a competitive basis but that the regions of interest (those

for which we want to assess the extent of the trade transmission channel) keep their relative trade balance fixed. Table 2 summarizes the characteristics of the scenarios.

Table 2. Scenarios Simulated

Scenario	Shock	Labor Market	Global Investment	Relative Trade Balance
Base	Decrease in capital endowment for the US and the EU	Unemployment in the unskilled and skilled labor market for the US and the EU	Allocated on a competitive basis	Endogenous
Fixed investment	Decrease in capital endowment for the US and the EU	Unemployment in the unskilled and skilled labor market for the US and the EU	Allocated on a fixed basis	Endogenous
Fixed trade balance	Decrease in capital endowment for the US and the EU	Unemployment in the unskilled and skilled labor market for the US and the EU	Allocated on a competitive basis	Fixed for regions of interest

The model runs on version 7 of the GTAP database, which has 2004 as the base year. It has 21 regions and 43 sectors. The regional disaggregation emphasizes the Western Hemisphere and its main trade partners. The sectoral disaggregation keeps agricultural, resource-based, and manufacturing sectors as detailed as the database allows. Appendix 1 summarizes both aggregations.

5. Results

5.1 The case of the US and the EU-27

As mentioned, the US and EU's economies are negatively shocked to reduce their capital endowment. The US capital endowment is reduced by 4 per cent, while that of the EU is reduced by 6.5 per cent. As a result the US' GDP drops by 2.69 per cent and the EU's by 4.88 per cent under the base scenario. The corresponding IMF's (2009) forecasts for the two economies are -2.6 per cent and -4.8 per cent, so the estimates arising from the simulation

are reasonably close to the expected behavior of these economies.

Table 3 shows the main macroeconomic effects arising from the simulations. From there it can be appreciated that for both countries there is small variation in GDP changes under the three scenarios. In the case of the US, exports are the GDP component that is

the most affected, while imports is the least affected. As regards the EU, foreign trade is affected the most. Exports show the highest percentage change, followed by imports. As expected, given the type of shock implemented, changes in all components of GDP are commensurate with the total change in GDP for both regions.

Table 3. Main Macroeconomic Effects from the Crisis on the US and the EU-27
(Percentages)

Country	Scenario	Consumption	Investment	Government	Exports	Imports	GDP
USA	Base	-2.59	-2.54	-2.60	-3.43	-2.35	-2.69
	Fixed investment	-2.64	-2.69	-2.65	-3.29	-2.44	-2.74
	Fixed trade balance	-2.61	-2.60	-2.62	-3.39	-2.40	-2.71
EU-27	Base	-4.71	-4.37	-4.81	-5.58	-4.90	-4.88
	Fixed investment	-4.63	-4.06	-4.74	-5.65	-4.81	-4.81
	Fixed trade balance	-4.72	-4.42	-4.83	-5.58	-4.92	-4.90

Source: author's simulations

In spite of changes in exports and imports, the regional structure of trade (in terms of regional shares) practically does not change for neither of the two countries. Tables 4 and 5 show percentage changes in trade flows for the main US trade partners for exports and imports under the three scenarios.

Taking into account that US exports decrease in between 3.3 per cent and 3.4 per cent, depending on the scenario (see Table 3), it is clear that trade with the EU decreases more than proportionally, as this region also dips into the crisis, while US exports to Canada and Mexico decrease the least.

Table 4. Percentage Changes in Regional Trade Flows for US Exports

Scenario	Asia	Canada	Mexico	Rest of America	EU_27	Rest of World
Base	-3.28	-2.07	-2.16	-3.31	-5.27	-3.16
Fixed investment	-3.37	-1.98	-2.07	-3.13	-4.94	-2.77
Fixed trade balance	-3.29	-2.05	-1.97	-3.01	-5.28	-3.14

Source: author's simulations

US imports decrease around 2.4 per cent under all scenarios. As happens with exports, imports from the EU decrease the most and proportionally more than exports do. There-

fore, there is more shifting among regions in US import flows as imports from regions other than the EU decrease moderately, especially in the cases of Japan and Canada (see Table 5).

Table 5. Percentage Changes in Regional Trade Flows for US Imports

Scenario	China	Japan	Rest of Asia	Canada	Mexico	Rest of America	EU_27	Rest of World
Base	-1.40	-0.58	-1.56	-0.90	-0.78	-2.06	-5.96	-1.94
Fixed investment	-0.78	-0.76	-1.47	-1.09	-1.00	-2.25	-6.25	-2.24
Fixed trade balance	-1.35	-0.50	-1.51	-0.88	-1.32	-2.48	-5.93	-1.89

Source: author's simulations

As regards the EU, Table 6 shows percentage changes in regional export flows for the region. As EU's exports decrease around 5.6 per cent (Table 3), intra EU exports and exports to the US decrease more than proportionally.

In this case, EFTA countries are the ones for which EU exports decrease the least. It should be noticed that trade with China suffers the most among regions other than the EU and the US.

Table 6. Percentage Changes in Regional Trade Flows for EU Exports

Scenario	China	Rest of Asia	USA	Rest of America	EU_27	EFTA	Rest of World
Base	-4.88	-4.37	-5.95	-3.99	-6.36	-2.43	-4.70
Fixed investment	-5.65	-4.73	-6.24	-4.17	-6.36	-2.27	-4.68
Fixed trade balance	-4.88	-4.37	-5.92	-3.74	-6.36	-2.42	-4.68

Source: author's simulations

Lastly, Table 7 presents percentage changes in regional imports by the EU. EU's imports decrease between 4.8 and 4.9 per cent, so it follows from the table that intra EU trade

and imports from the US make the bulk of the adjustment. However, it must be noticed that trade with the Rest of the World also bears an important adjustment.

Table 7. Percentage Changes in Regional Trade Flows for EU Imports

Scenario	China	Japan	Rest of Asia	USA	Rest of America	EU_27	EFTA	Rest of World
Base	-1.31	-0.53	-1.57	-5.27	-1.58	-6.36	-1.20	-3.32
Fixed investment	-0.31	-0.34	-1.12	-4.94	-1.51	-6.36	-1.64	-3.34
Fixed trade balance	-1.33	-0.51	-1.58	-5.28	-1.95	-6.36	-1.20	-3.33

Source: author's simulations

In terms of volumes, trade shrinks for both regions. Export volumes from the US to all regions decrease. Exports to the EU contribute in between 40.2 per cent and 41.6 per cent to trade shrinkage, depending on the scenario, while exports to Asia contribute from 26.7 per cent to 28.4 per cent. Exports to Canada account for around 11.5 per cent of the decrease, while exports to Mexico for around 6.6 per cent. In the case of the EU, the greatest contributor to export shrinkage is intra-EU exports. It accounts for around 70 per cent under all scenarios. The second largest is trade with the US, which makes up in between 9.3 and 9.7 per cent of export volume decreases.

Imports volumes decrease as a whole for the US. However, not all import flows decrease, as there are regions for which figures are positive. The most notable cases are those of Canada, Mexico, and EFTA under the base scenario (although increases are meager in general). The situation is similar for the EU. Imports from EFTA (under the base scenario and the fixed trade balance scenario) and

China and Japan (under the fixed investment scenario) increase modestly while decrease for the rest of regions. The EU is the biggest contributor to the decrease in US imports, under all scenarios followed by Asia. In the case of the EU, intra-EU trade shows the biggest share in trade shrinkage (around 88 per cent), followed by the US (7.8 per cent as average).

A notable result is the way terms of trade play to somehow mitigate the deterioration of the two economies (a characteristic associated with both being big countries). As shown in Table 8, the price index of imports decreases relatively sharply in the case of the US, while the price index of exports increases. This brings, as a result, a noticeable improvement in the terms of trade for this economy. Important but lower improvements in the terms of trade attain for the EU. However, in this case, they are mostly due to an important increase in the price index of exports (although the price index of imports decreases, the decrease is relatively modest).

Table 8. Terms of Trade Changes for the US and the EU's economies

Country	Scenario	Price index of imports	Price index of exports	Terms of trade
USA	Base	-0.64	0.18	0.83
	Fixed investment	-0.65	0.15	0.81
	Fixed trade balance	-0.63	0.17	0.81
EU-27	Base	-0.07	0.46	0.53
	Fixed investment	-0.05	0.50	0.55
	Fixed trade balance	-0.07	0.45	0.53

Source: author's simulations

Lastly, as can be expected from the above, in terms of welfare both economies loose. The US economy loses welfare in an amount equivalent to 2.64 per cent of GDP while the EU economy loses 4.61 per cent of GDP. As an average, allocative efficiency losses contribute 34 per cent of total welfare losses in the US and 46.4 per cent in the EU. By far the biggest contributor to welfare losses for both economies is changes in factor endowments. These originate in the capital endowment shock through which the crisis is simulated here and in changes in the level of employment for both unskilled and skilled labor. In the US factor changes contribute 70.2 per cent of total welfare losses while in the EU they contribute 57.1 per cent. As mentioned, changes in terms of trade make positive contributions to economic results for both economies. In the case of the US they make a positive contribution equivalent to 3.4 per cent of welfare (absolute) changes and in the case of the EU a positive contribution equivalent to 3.6 per cent. The

savings/investment position of the economy plays a positive role in the case of the US (0.8 per cent of the welfare change) and a negative one in the case of the EU (0.1 per cent).

5.2 The Case of Countries of Interest

For illustrative purposes I consider the cases of Mexico, Argentina, Brasil, Chile, Colombia, Ecuador, Peru, and Venezuela. Results attained for trade flows are discussed first, then GDP changes are presented, and lastly impacts on real factor returns and welfare.

Overall, the value of exports is expected to decline. As an average exports may decrease by 1.1 per cent, Venezuela showing the largest decrease (2 per cent) and Argentina the lowest (0.6 per cent). Table 9 shows average percentage changes in the value of exports by region of origin and destination.⁵ From there it follows that exports to the US and the EU should decline, while exports to Asia, the Rest of America, and the Rest of the World (mostly) increase.

⁵ The figures correspond to the average over the three scenarios considered.

Table 9. Percentage Changes in Regional Export Flows for Selected Latin American Countries

Origin/Destination	Asia	USA	Rest of America	EU_27	Rest of World	Total
Mexico	1.3	-1.0	1.9	-2.1	1.7	-0.7
Argentina	0.3	-2.8	0.1	-1.4	-0.4	-0.6
Brasil	0.1	-1.3	0.8	-2.0	-0.3	-0.7
Chile	0.3	-1.9	0.7	-2.3	0.2	-0.7
Colombia	2.3	-3.2	1.4	-2.6	1.0	-1.1
Ecuador	0.1	-3.6	0.3	-0.2	0.2	-1.6
Peru	0.1	-1.6	0.2	-2.5	0.8	-1.0
Venezuela	3.8	-3.4	2.3	-2.2	4.6	-2.0

Source: author's simulations

On the other side, Table 10 shows average percentage changes in the value of imports by region.⁶ In general, imports decline for all Latin American countries analyzed, the average decrease being 1.5 per cent, the sharpest corresponding to Venezuela (2.1 per cent) and the

lowest to Argentina (1 per cent). As expected, imports from the US and the EU decline. With respect to other regions, imports from the Rest of America and the Rest of the World increase and imports from Asia tend to increase too.

Table 10. Percentage Changes in Regional Import Flows for Selected Latin American Countries

Origin/Destination	Asia	USA	Rest of America	EU_27	Rest of World	Total
Mexico	2.3	-2.1	2.4	-3.6	2.7	-1.1
Argentina	0.9	-3.2	1.2	-4.5	2.2	-1.0
Brasil	0.9	-2.9	0.8	-4.1	0.7	-1.5
Chile	0.6	-2.8	0.0	-3.9	1.2	-1.2
Colombia	0.2	-3.6	1.6	-5.1	1.8	-1.6
Ecuador	-1.0	-4.3	0.2	-5.9	0.5	-2.0
Peru	0.2	-3.6	0.1	-4.8	1.7	-1.6
Venezuela	-0.3	-3.8	0.6	-5.6	0.7	-2.1

Source: author's simulations

Of course, changes in trade values are determined by both changes in volumes and

in prices. For brevity and to illustrate the way quantity and price effects play in determining changes in trade values, Tables 11 and 12 show the behavior of a set of sectors (exportable and importable, respectively) for each country of interest under the base scenario.

⁶ Again, figures correspond to the average over the three scenarios considered.

From Table 11 it can be appreciated that Venezuela, Ecuador, Mexico, Chile, and Peru, are the countries with the highest concentration of exports in a few sectors (column “Sectors”). Using the base year export shares for each sector as weights, the column “Fob price” shows the percentage change in export prices for the selected set of sectors, while the columns “Quantity” and “Value” show the corresponding percentage changes in exported volumes and the value of exports. For reference, the last column (“Total”) shows the estimated percentage change for the value of all exports.

The countries with the highest decreases in prices are Venezuela, Ecuador, and Colombia. Regarding quantities, almost all countries of interest show modest increases. The exceptions to this are Venezuela and Colombia. From these data, it follows that the countries with the largest decreases in export value for the main sectoral exports (Venezuela, Ecuador, and Colombia) attain this result due mainly to price decreases (with quantity decreases pointing in the same direction in two out of the three cases).

Table 11. Price and Quantity Percentage Changes for the Main Sectoral Exports in Selected Latin American Countries

Country	Sectors	Export share	Fob price	Quantity	Value	Total
Mexico	5	76.3	-0.8	0.3	-0.5	-0.51
Argentina	11	74.2	-0.9	0.3	-0.6	-0.43
Brasil	14	76.8	-0.7	0.7	0.1	-0.40
Chile	5	76.6	-0.7	0.0	-0.7	-0.80
Colombia	9	73.6	-1.8	-0.1	-1.8	-1.12
Ecuador	3	79.2	-2.1	0.2	-1.9	-1.33
Peru	5	76.8	-0.7	0.1	-0.6	-0.76
Venezuela	2	78.1	-2.7	-0.5	-3.2	-1.64

Source: author's simulations

Table 12 shows analogous information from the import side. As known, imports tend to be more diversified than exports, Chile and Peru being the countries with the highest relative diversification. In general, import prices decline. The largest decreases are found in the cases of Peru and Chile while it is noticeable the fact that import prices increase negligibly

for Mexico. Quantities imported decrease in all cases, the largest corresponding to Venezuela, Ecuador, Brasil, and Colombia. As a consequence, while export values tend to decrease due to price declines, imports tend to decrease because of both price and quantity decreases, the latter being the most important.

Table 12. Price and Quantity Percentage Changes for the Main Sectoral Imports in Selected Latin American Countries

Country	Sectors	Export share	Cif price	Quantity	Value	Total
Mexico	6	74.1	0.1	-0.8	-0.7	-1.21
Argentina	5	75.0	-0.2	-0.5	-0.7	-1.11
Brasil	6	73.2	-0.3	-0.9	-1.2	-1.60
Chile	9	73.8	-0.6	-0.3	-0.9	-1.16
Colombia	7	75.5	-0.2	-0.9	-1.1	-1.62
Ecuador	7	75.4	-0.5	-1.0	-1.5	-2.38
Peru	9	74.7	-0.6	-0.7	-1.4	-1.71
Venezuela	8	75.1	-0.2	-1.2	-1.4	-2.43

Source: author's simulations

The above suggests that terms of trade play against this group of economies (contrary to what happens with the US and EU's economies). In fact, terms of trade deteriorate for all economies under consideration. As average over the three scenarios considered, terms of trade decrease by 0.94 per cent in the case of Mexico, 0.86 for Argentina, 0.43 for Brasil, 0.29 for Chile, 1.68 for Colombia, 1.82 for Ecuador, 0.27 for Peru, and 2.84 for Venezuela. The relatively large impact of terms of trade changes in the cases of Venezuela, Ecuador, and Colombia, is due to the fact that several of their most important exports are among the sectors for which international prices decline the most (as oil, coal, other crops, and petroleum and coal products).

As the crisis hits demand in the US and the EU, international prices tend to fall as their trade drops. Lower imports and exports to and from these economies, imply some adjustment in the patterns of trade, as shown in Tables 9 and 10. This adjustment occurs as relative prices change and the economies move towards reestablishing equilibrium (including current account equilibrium). Countries exporting to

the US and the EU products belonging to the sectors were imports relatively shrink the most, will be harder hit from the export side. The same is true from the import side. Countries importing products belonging to sectors where US and EU's exports shrink the most, will have their trade most affected.

Therefore, it is not only the degree of trade dependence with respect to the US and EU's economies what matter for determining the size of the impact that arises from the crisis and is transmitted through the trade channel. From the above it is clear that the structure of trade plays an important role. For instance, a country with lower trade dependence with respect to the two economies from which the crisis originates but commercially linked to them through the sectors with larger declines, could be harder hit than a country with greater trade dependency but linked through sectors showing lower declines. Furthermore, the direction of changes in relative prices does matter in determining the size and direction of the impacts. As shown above, for the set of countries of interest, the effect of export prices dominates from the export side while the effect

of volume changes dominates from the import side. In fact, in this case terms of trade changes play against this set of economies. In particular, as the economies try to reestablish equilibrium, export prices falling more than import prices lead to increases in export volumes so as to partly compensate for the lower decline in total import value.

This is why a country like Mexico, whose joint exports to the US and the EU represent roughly 87 per cent of total exports, shows lower decreases in total export value than countries like Colombia or Ecuador (with joint export shares to the US and the EU of about 59 and 66 per cent, respectively). Of course, lower trade dependence with respect to these two economies correlates with a trend to lower impacts on trade (as the cases of Argentina, Brasil, and Chile show –with 34, 49, and 45 per cent of total exports going to the US and the EU).

Trade changes affect output in several ways. Decreases in export volumes and increases in import volumes clearly lead to decreases in the volume of domestic production. However, this clear cut case is just one of the several possible cases. If export volumes increase and import volumes increase, the net effect on output volume will depend upon relative export and import volume changes. On the

other hand, as relative prices adjust globally the valuation of output quantity will change accordingly. Furthermore, as relative prices change, consumers optimally adjust their consumption baskets in response (changing also the composition of imported to domestically produced goods in demand). Therefore, output changes are the result of a complex mix of effects.

Table 13 shows percentage changes in the GDP quantity index, the GDP price index, and the value of GDP for the countries under study. From there, it can be appreciated that the value of GDP for all countries under all scenarios considered diminishes. The highest average (across countries) decreases are attained under the base scenario, followed by the fixed investment scenario, and lastly by the fixed trade balance scenario (1.5, 1.4, and 1.2 per cent, respectively). The decomposition of value changes among price and quantity changes shows that price changes dominate. In effect, in all cases the price index decreases and its absolute value is higher than the change in the quantity index. Although, in general, changes in quantity tend to be negative, there are cases in which the volume of GDP increases. This is so most frequently under the fixed trade balance scenario as well as for some countries (Chile and Peru in particular).

Table 13. Percentage Changes in GDP Quantity, Price, and Value Indices for Selected Latin American Countries

Scenario	Country	Quantity index	Price index	Value index
Base	Mexico	-0.11	-1.18	-1.29
	Argentina	-0.03	-1.15	-1.18
	Brasil	-0.02	-0.86	-0.88
	Chile	0.01	-0.82	-0.81
	Colombia	-0.01	-1.57	-1.58
	Ecuador	-0.05	-2.16	-2.22
	Peru	0.00	-0.90	-0.90
	Venezuela	-0.01	-2.87	-2.88
Fixed investment	Mexico	-0.10	-1.14	-1.24
	Argentina	-0.03	-1.10	-1.13
	Brasil	-0.01	-0.81	-0.82
	Chile	0.01	-0.86	-0.85
	Colombia	-0.01	-1.63	-1.65
	Ecuador	-0.03	-1.94	-1.97
	Peru	0.00	-0.86	-0.86
	Venezuela	-0.01	-2.57	-2.58
Fixed trade balance	Mexico	-0.05	-1.02	-1.07
	Argentina	-0.01	-0.90	-0.91
	Brasil	0.00	-0.64	-0.64
	Chile	0.02	-0.74	-0.72
	Colombia	0.00	-1.40	-1.40
	Ecuador	-0.02	-1.84	-1.86
	Peru	0.01	-0.74	-0.73
	Venezuela	-0.01	-2.45	-2.46

Source: author's simulations

As for any other good in the economy, factor returns are affected by the above adjustments as demand for them switches between sectors and returns equalize across the economy (it is worth remembering that here it is assumed that this set of countries has full

factor employment). Then, real factor returns provide a glimpse over the distributive effects of the crisis as it is transmitted through the trade channel. Table 14 shows average (over the three scenarios) percentage changes in real factor returns for all countries of interest.

Table 14. Percentage Changes in Real Factor Returns for Selected Latin American Countries

Country	Land	Unskilled labor	Skilled labor	Capital	Natural resources
Mexico	-1.97	-0.15	-0.14	-0.01	-14.51
Argentina	0.09	0.02	-0.01	-0.01	-6.91
Brasil	-1.42	0.12	0.06	0.10	-8.72
Chile	-1.91	0.04	0.02	0.05	-3.34
Colombia	-0.46	0.03	-0.06	-0.07	-8.20
Ecuador	0.03	-0.20	-0.29	-0.53	-4.65
Peru	-0.77	0.13	0.11	0.11	-3.63
Venezuela	-0.68	-0.14	-0.27	-0.35	-5.17

Source: author's simulations

As trade of natural resource-based products (oil, coal, minerals, etc.) is one of the most affected, it is no surprise that real factor returns to natural resources decline and do it in a considerable larger measure than for other factors. Land is a factor that is specific for a set of sectors (agriculture and livestock) and is characterized by its sluggishness in switching among uses. Therefore, in the face of declining prices and demand its real factor return tends to drop. The exceptions to this are Argentina and Ecuador, countries where important agricultural sectors experience increases. Results for labor (unskilled and skilled) and capital are mixed. Returns for skilled labor and capital tend to move in tandem while the behavior of unskilled labor returns tends to be positive for most countries. In general while changes in real factor returns to natural resources and land are, in general, relatively important, changes in factor returns for labor and capital tend to be negligible.

The summary measure of the economic effects of the crisis (as transmitted through the trade channel) on the Latin American economies of interest is welfare changes. Table 15 shows welfare changes (measured as the

equivalent variation in US\$ millions of 2004) for the whole set of countries under the three scenarios. As shown, welfare decreases in all cases but, as a percentage of GDP the losses are small. As an average, welfare decreases by 0.3 per cent of GDP while the value of GDP decreases by 1.4 per cent. As must be obvious, the difference basically arises from price changes. As world prices tend to fall, real income does not fall as much as the value of GDP.

From the components of welfare changes, it is terms of trade effects the one that drives the results. On average, terms of trade effects explain around 88 per cent of welfare changes. Summarily, the way terms of trade effects are calculated is the following. In the case of exports, if the difference between the percentage change in the fob price and the world price for a product is positive, the effect on welfare is positive as the price of the good domestically produced and exported increases with respect to its international price.⁷ Conversely, if the

⁷ It must be recalled that in this model products of the same kind (sector) are differentiated by their place of origin and are imperfectly substitutable, therefore their prices differ.

difference between the percentage change in the fob price of an imported product (that is, its fob price in the country of origin) and the world price of the product is positive, the effect on welfare is negative as the price of the imported product increases with respect

to its international price. Also, relative price changes for transport services are taken into account. Therefore, terms of trade effects stem from the relationship between world prices, export prices of the country, and import prices to the country.

Table 15. Welfare Changes for Selected Latin American Economies Arising from the Crisis as Transmitted through the Trade Channel (Equivalent Variation –US\$ millions of 2004)

Scenario	Country	Allocative effects	Savings-Investment	Terms of trade	Total welfare	% of GDP
Base	Mexico	-749	-76	-1,880	-2,705	-0.4
	Argentina	-46	25	-347	-367	-0.2
	Brasil	-107	-4	-605	-716	-0.1
	Chile	9	-7	-134	-132	-0.1
	Colombia	-7	-16	-321	-344	-0.4
	Ecuador	-16	8	-198	-206	-0.7
	Peru	-1	-2	-47	-50	-0.1
	Venezuela	-15	237	-1,042	-820	-0.8
Fixed investment	Mexico	-653	-77	-1,812	-2,542	-0.4
	Argentina	-40	21	-335	-355	-0.2
	Brasil	-89	-17	-564	-670	-0.1
	Chile	7	-2	-146	-141	-0.2
	Colombia	-14	-15	-330	-360	-0.4
	Ecuador	-8	5	-184	-187	-0.6
	Peru	0	-3	-44	-47	-0.1
	Venezuela	-10	190	-993	-813	-0.8
Fixed trade balance	Mexico	-364	-79	-1,685	-2,125	-0.3
	Argentina	-13	-1	-297	-310	-0.2
	Brasil	-7	-68	-409	-483	-0.1
	Chile	19	-13	-121	-114	-0.1
	Colombia	-1	-16	-307	-323	-0.3
	Ecuador	-7	4	-182	-185	-0.6
	Peru	5	-5	-34	-33	0.0
	Venezuela	-9	171	-987	-824	-0.8

Source: author's simulations

For the countries studied, using the base scenario as an illustration, it can be observed that for Mexico, Argentina, Colombia, and Venezuela both exports and imports contribute negatively to terms of trade effects. That

is, for these countries export prices increase less than the corresponding world price and import prices increase more than the corresponding world prices. In the cases of Brasil, Chile, Ecuador, and Peru, exports contribute

negatively while imports contribute positively. Therefore, for them export prices increase less than world prices but import prices decrease relative to the relevant world prices. Of course, this signals the direction of welfare changes but their magnitude depends not only upon relative price changes but also on the importance of the specific sectors in export and import trade. Finally, it is important to mention that in all cases the biggest contributor to terms of trade originated welfare changes is the deterioration in export prices.

As a summary, the effects of the global crisis on the selected Latin American economies, as transmitted through the trade channel, are expected to be negative. However, their extent not necessarily depends on their degree of trade dependence with respect to the US and EU's economies. Trade composition, in terms of the export and import portfolio, matters. The same is true as it refers to price changes. Even though the impact on the value of trade flows (exports and imports) looks moderate, the drop in the value of GDP is larger and not negligible. In spite of this, when the impact is measured in terms of welfare it turns out that it is quite moderate (a consequence of lower world and domestic prices).

5.3 Sensitivity Analysis

Given the intrinsic uncertainty on the extent of the effect of the crisis on the US and EU's economies, it is convenient to test the above results with respect to changes in the expected decline in GDP for them. For this, a systematic sensitivity analysis was carried out with respect to the size of the shock to the capital stock in both economies. The shocks were allowed to jointly vary by 50 per cent above and below the benchmark (as mentioned, 4 per cent in the case of the US and 6.5 per cent in the case of the EU). With this variation, expected changes in GDP for the US and the EU will range in between -3.31 and -2.11 per cent for the US and -6.01 and -3.72 per cent for the EU, as an average across the three scenarios. As can be appreciated, this variation must accommodate the range of available estimates for the expected shrinkage of these economies.

Given the above, confidence intervals at the 94 per cent confidence level were built for the estimates of changes in GDP, value of exports, value of imports, and welfare for the Latin American economies of interest. For simplicity of presentation, and considering that confidence intervals for all scenarios are consistent in that they are relatively close in value and have no sign switches, Table 16 presents confidence intervals for the average of the three scenarios. Fully detailed tables are presented in the appendix.

Table 16. Confidence Intervals (94 per cent) for the Main Impacts arising from the Crisis on Latin American Economies

Value of GDP*				Value of Exports*			
Country	Lower limit	Mean	Upper limit	Country	Lower limit	Mean	Upper limit
Mexico	-1.43	-1.20	-0.97	Mexico	-0.91	-0.75	-0.59
Argentina	-1.26	-1.07	-0.89	Argentina	-0.72	-0.61	-0.50
Brasil	-0.93	-0.78	-0.63	Brasil	-0.79	-0.67	-0.55
Chile	-0.94	-0.79	-0.65	Chile	-0.95	-0.80	-0.66
Colombia	-1.81	-1.54	-1.28	Colombia	-1.35	-1.15	-0.95
Ecuador	-2.35	-2.02	-1.68	Ecuador	-1.87	-1.59	-1.31
Peru	-0.98	-0.83	-0.68	Peru	-1.11	-0.95	-0.79
Venezuela	-3.08	-2.64	-2.20	Venezuela	-2.31	-1.98	-1.64

Welfare**				Value of Imports*			
Country	Lower limit	Mean	Upper limit	Country	Lower limit	Mean	Upper limit
Mexico	-2933.24	-2457.71	-1982.17	Mexico	-1.35	-1.14	-0.93
Argentina	-404.76	-344.09	-283.43	Argentina	-1.20	-1.01	-0.83
Brasil	-736.10	-622.96	-509.83	Brasil	-1.73	-1.46	-1.19
Chile	-155.06	-129.05	-103.03	Chile	-1.38	-1.17	-0.96
Colombia	-400.46	-342.44	-284.43	Colombia	-1.89	-1.61	-1.33
Ecuador	-225.68	-192.75	-159.82	Ecuador	-2.40	-2.05	-1.70
Peru	-51.34	-43.50	-35.66	Peru	-1.82	-1.56	-1.29
Venezuela	-958.81	-819.02	-679.23	Venezuela	-2.46	-2.11	-1.77

*percentage change

**US\$ millions of 2004

Source: author's simulations

From these data it follows that results are robust both from the point of view of their magnitudes and signs. Therefore, it can be expected that GDP, welfare, the value of exports, and the value of imports will decrease for all countries considered.

From the point of view of changes in GDP, the countries with the lowest negative impacts are Brasil, Chile and Peru, while those most affected are Venezuela and Ecuador. With respect to exports, the least affected countries are Argentina, Brasil, and Mexico and the most affected are Venezuela and Ecuador. Regarding changes in imports, the countries

less impacted are Argentina, Mexico, and Chile and the most impacted are Venezuela, Ecuador, and Colombia. Lastly with respect to welfare, the countries with the lowest relative impacts are Argentina, Mexico, and Chile, while those with the highest relative impacts are Venezuela, Ecuador, and Colombia.

6. Concluding Comments

This research attempts to provide an avenue for assessing the short run impact of the financial and economic crisis on a set of

Latin American economies, as it is transmitted along and (mostly) only through the trade channel. For this a real sector model is used, the multiregion, constant returns to scale, computable general equilibrium GTAP model. The modeling strategy is based on implementing a negative shock to the capital stock of the US and EU's economies, in such a way that the resulting behavior of the value of GDP is close to that forecasted for 2009 by the IMF. It also considers that labor markets in these economies clear by adjusting the level of employment, an assumption consistent with a short run perspective and observed behavior.

Results for the US and EU's economies indicate that the US economy may shrink in between 2.69 and 2.74 per cent and the EU's in between 4.81 and 4.9 per cent. The value of exports would decrease around 3.37 and 5.6 per cent in the US and the EU, respectively, while the value of imports would do so by around 2.4 per cent in the US and 4.87 per cent in the EU.

For the Latin American economies considered (Mexico, Argentina, Brasil, Chile, Colombia, Ecuador, Peru, and Venezuela) the value of exports is expected to decline. As an average, exports may decrease by 1.1 per cent, Venezuela showing the largest decrease (2 per cent) and Argentina the lowest (0.6 per cent). Similarly, imports decline for all Latin American countries analyzed, the average decrease being 1.5 per cent, the sharpest corresponding to Venezuela (2.1 per cent) and the lowest to Argentina (1 per cent). As expected, exports to and imports from the US and the EU decline.

In the case of the US and EU's economies, the estimated decline in GDP closely matches (by design) that forecasted by the

IMF (2009). In contrast, the resulting estimation for the decrease in trade is well below (the IMF forecasts a 13.6 per cent decline in imports volume and a 15 per cent decline in exports volume for advanced economies). As mentioned in section 2, with the fragmentation of international production, frequently accompanied by vertical FDI, changes in GDP get amplified when reflected on changes in trade. Therefore, a decline in GDP, linked to smaller outsourcing, will lead to a greater decrease in trade as intermediate goods cease to travel back and forth, at the international level, before a good gets to the final consumer. If, as Freund (2009) estimates, the growth elasticity of trade is near 3.7, a 2.6 per cent decline in US' GDP may lead to a 9.6 per cent decline in trade and a 4.8 per cent decrease in EU's GDP to a 17.8 per cent decline in trade.

There may be several reasons why a model like the one used here do not reflect such a big change in trade when GDP is affected (leaving aside issues related to parameters, like the elasticity of substitution between domestic and imported goods). One may be the sectoral aggregation used in the model. However, this effect is relatively minor as compared to that of other factors.

By its own nature, the model cannot take into account a whole set of factors that may bear heavily on trade changes. Freund (2009) lists a series of reasons why trade may respond more sharply to GDP during global slowdowns than during normal times, which are not taken into account in this modeling exercise. (a) Firms may draw down accumulated inventories sharply when faced to forecasts that deteriorate unexpectedly; (b) during crisis, protectionist policies tend to kick in; (c)

goods decline by more than services during downturns, and services make up the bulk of GDP, while goods make up the bulk of trade; (d) firms may tend to source relatively more from home country suppliers during downturns because of trust or financing problems. Furthermore, being a financial crisis, the issue of trade financing is important. Escaith and Gonguet (2009) provide an approximation to the analysis of the role of international supply chains as transmission channel of a financial shock. They show that when banks operate at the limit of their institutional capacity, and if assets are priced to market, then a resonance effect amplifies the back and forth transmission between real and monetary circuits, sharply lowering trade flows.

Even though this type of models seem to underestimate trade flows changes, not only because of the above but also due to the constant returns to scale specification, they tend to yield more precise estimates for GDP changes. The main reason is that big changes at the sectoral level translate into relatively small changes in the aggregated economy. In other words, it takes dramatic and key changes at the sectoral level (including trade) to generate sizeable changes at the aggregate level. For instance, it takes a 4 per cent reduction in the US' capital stock (a truly big shock in a key variable) to get a decrease of 2.6 per cent in GDP. Therefore, at least for a case like the one that is of interest here, estimates for the change in GDP should be deemed more dependable (and significant) than, say, changes in trade flows.

With the above in mind, estimated changes in GDP for the set of countries under study indicate that the value of GDP for all

countries under all scenarios considered diminishes. The highest average (across countries) decreases are attained under the base scenario, followed by the fixed investment scenario, and lastly by the fixed trade balance scenario (1.5, 1.4, and 1.2 per cent, respectively). The decomposition of value changes among price and quantity changes shows that price changes dominate. In effect, in all cases the price index decreases and its absolute value is higher than the change in the quantity index. Although, in general, changes in quantity tend to be negative, there are cases in which the volume of GDP increases. This is so most frequently under the fixed trade balance scenario as well as for some countries (Chile and Peru in particular).

The countries with the lowest negative impacts are Brasil, Chile and Peru, while those most affected are Venezuela and Ecuador. However, there is no necessary correspondence between trade and GDP changes. With respect to exports, the least affected countries are Argentina, Brasil, and Mexico and the most affected are Venezuela and Ecuador. Regarding changes in imports, the countries less impacted are Argentina, Mexico, and Chile and the most impacted are Venezuela, Ecuador, and Colombia.

This happens as the effects do not necessarily depend on the economies' degree of trade dependence with respect to the US and EU's economies. Trade composition, in terms of the export and import sectoral portfolio, also matters. The same is true as it refers to worldwide price changes. Even though the impact on the value of trade flows (exports and imports) may look moderate, the drop in the value of GDP is larger and not negligible. In spite of this, when

the impact is measured in terms of welfare it turns out that it is quite low (a consequence of lower world and domestic prices).

This research provides estimates on the direction and magnitude of the likely impacts of the crisis, transmitted through what could be called a pure trade channel, on key macro variables for the set of Latin American economies under study. Besides this, it highlights some issues frequently overlooked when attempting to assess them: the general equilibrium effects arising from trade composition and worldwide terms of trade changes.

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Appendix

Table A.1 Sector Aggregation in the Model

Sector Code	Description	Sector Code	Description
pdr	Paddy rice	pcr	Processed rice
wht	Wheat	sgr	Sugar
gro	Cereal grains nec	ofd	Food products nec
v_f	Vegetables, fruits	b_t	Beverages and tobacco products
osd	Oil seeds	tex	Textiles
c_b	Sugar cane, sgar beet	wap	Wearing apparel
pfb	Plant-based fibers	lea	Leather products
ocr	Crops nec	lum	Wood products
ctl	Cattle, sheep, goats	ppp	Paper products and publishing
oap	Animal products nec	p_c	Petroleum, coal products
rmk	Raw milk	crp	Chemical, rubber and plastic prod
wol	Wool, silk-worm coc	nmn	Mineral products nec
frs	Forestry	i_s	Ferrous metals
fsh	Fishing	nfm	Metals nec
coa	Coal	fmp	Metal products
oil	Oil	mvh	Motor vehicles and parts
gas	Gas	otn	Transport equipment nec
omn	Minerals nec	ele	Electronic equipment
cmt	Meat: cattle, sheep	ome	Machinery and equipment nec
omt	Meat products nec	omf	Manufactures nec
vol	Vegetable oils and fats	ser	Services
mil	Dairy products		

Table A.2 Regional Aggregation in the Model

Region Code	Description	Region Code	Description
CHK	China and Hong Kong	COL	Colombia
JPN	Japan	ECU	Ecuador
KOR	Korea	PRY	Paraguay
RAS	Rest of Asia	PER	Peru
CAN	Canada	URY	Uruguay
USA	United States	VEN	Venezuela
MEX	Mexico	RAM	Rest of America
ARG	Argentina	EU_27	European Union 27
BOL	Bolivia	EFTA	EFTA
BRA	Brasil	ROW	Rest of World
CHL	Chile		

Table A.3. Confidence Intervals (94 per cent) for the Main Impacts arising from the Crisis on Latin American Economies. Base Scenario.

Value of GDP*				Value of Exports*			
Country	Lower limit	Mean	Upper limit	Country	Lower limit	Mean	Upper limit
Mexico	-1.53	-1.29	-1.05	Mexico	-0.63	-0.51	-0.39
Argentina	-1.38	-1.18	-0.98	Argentina	-0.51	-0.43	-0.35
Brasil	-1.04	-0.88	-0.72	Brasil	-0.48	-0.4	-0.32
Chile	-0.97	-0.81	-0.65	Chile	-0.96	-0.8	-0.64
Colombia	-1.86	-1.58	-1.3	Colombia	-1.32	-1.12	-0.92
Ecuador	-2.58	-2.22	-1.86	Ecuador	-1.57	-1.33	-1.09
Peru	-1.06	-0.9	-0.74	Peru	-0.89	-0.77	-0.65
Venezuela	-3.36	-2.88	-2.4	Venezuela	-1.92	-1.64	-1.36
Welfare**				Value of Imports*			
Country	Lower limit	Mean	Upper limit	Country	Lower limit	Mean	Upper limit
Mexico	-3228.3	-2705.42	-1982.17	Mexico	-1.45	-1.21	-0.97
Argentina	-431.76	-367.08	-283.43	Argentina	-1.31	-1.11	-0.91
Brasil	-845.15	-716.19	-509.83	Brasil	-1.88	-1.6	-1.32
Chile	-158.33	-131.77	-103.03	Chile	-1.37	-1.17	-0.97
Colombia	-402.44	-344.32	-284.43	Colombia	-1.9	-1.62	-1.34
Ecuador	-241.15	-205.99	-159.82	Ecuador	-2.78	-2.38	-1.98
Peru	-59.21	-50.25	-35.66	Peru	-1.99	-1.71	-1.43
Venezuela	-960.22	-819.98	-679.23	Venezuela	-2.83	-2.43	-2.03

*percentage change

**US\$ millions of 2004

Source: author's simulations

Table A.4. Confidence Intervals (94 per cent) for the Main Impacts arising from the Crisis on Latin American Economies. Fixed Investment Scenario.

Value of GDP*				Value of Exports*			
Country	Lower limit	Mean	Upper limit	Country	Lower limit	Mean	Upper limit
Mexico	-1.48	-1.24	-1	Mexico	-0.86	-0.7	-0.54
Argentina	-1.33	-1.13	-0.93	Argentina	-0.57	-0.49	-0.41
Brasil	-0.98	-0.82	-0.66	Brasil	-0.61	-0.53	-0.45
Chile	-1.01	-0.85	-0.69	Chile	-0.75	-0.63	-0.51
Colombia	-1.93	-1.65	-1.37	Colombia	-1.05	-0.89	-0.73
Ecuador	-2.29	-1.97	-1.65	Ecuador	-1.9	-1.62	-1.34
Peru	-1.02	-0.86	-0.7	Peru	-0.99	-0.83	-0.67
Venezuela	-3.02	-2.58	-2.14	Venezuela	-2.41	-2.05	-1.69
Welfare**				Value of Imports*			
Country	Lower limit	Mean	Upper limit	Country	Lower limit	Mean	Upper limit
Mexico	-3023.41	-2542.17	-2060.93	Mexico	-1.36	-1.16	-0.96
Argentina	-417.54	-354.74	-291.94	Argentina	-1.24	-1.04	-0.84
Brasil	-792.94	-669.78	-546.62	Brasil	-1.79	-1.51	-1.23
Chile	-169.54	-141.34	-113.14	Chile	-1.51	-1.27	-1.03
Colombia	-421.07	-359.63	-298.19	Colombia	-2.09	-1.77	-1.45
Ecuador	-219.4	-187.32	-155.24	Ecuador	-2.28	-1.96	-1.64
Peru	-55.3	-46.82	-38.34	Peru	-1.9	-1.62	-1.34
Venezuela	-952.32	-813.44	-674.56	Venezuela	-2.26	-1.94	-1.62

*percentage change

**US\$ millions of 2004

Source: author's simulations

Table A.5. Confidence Intervals (94 per cent) for the Main Impacts arising from the Crisis on Latin American Economies. Fixed Trade Balance Scenario.

Value of GDP*				Value of Exports*			
Country	Lower limit	Mean	Upper limit	Country	Lower limit	Mean	Upper limit
Mexico	-1.27	-1.07	-0.87	Mexico	-1.25	-1.05	-0.85
Argentina	-1.07	-0.91	-0.75	Argentina	-1.07	-0.91	-0.75
Brasil	-0.76	-0.64	-0.52	Brasil	-1.29	-1.09	-0.89
Chile	-0.84	-0.72	-0.6	Chile	-1.14	-0.98	-0.82
Colombia	-1.64	-1.4	-1.16	Colombia	-1.67	-1.43	-1.19
Ecuador	-2.18	-1.86	-1.54	Ecuador	-2.15	-1.83	-1.51
Peru	-0.85	-0.73	-0.61	Peru	-1.46	-1.26	-1.06
Venezuela	-2.86	-2.46	-2.06	Venezuela	-2.6	-2.24	-1.88

Welfare**				Value of Imports*			
Country	Lower limit	Mean	Upper limit	Country	Lower limit	Mean	Upper limit
Mexico	-2548.01	-2125.53	-1703.05	Mexico	-1.25	-1.05	-0.85
Argentina	-364.98	-310.46	-255.94	Argentina	-1.05	-0.89	-0.73
Brasil	-570.2	-482.92	-395.64	Brasil	-1.51	-1.27	-1.03
Chile	-137.31	-114.03	-90.75	Chile	-1.27	-1.07	-0.87
Colombia	-377.86	-323.38	-268.9	Colombia	-1.67	-1.43	-1.19
Ecuador	-216.5	-184.94	-153.38	Ecuador	-2.13	-1.81	-1.49
Peru	-39.51	-33.43	-27.35	Peru	-1.58	-1.34	-1.1
Venezuela	-963.88	-823.64	-683.4	Venezuela	-2.29	-1.97	-1.65

*percentage change

**US\$ millions of 2004

Source: author's simulations