THE INTERNATIONAL ECONOMIC CRISIS AND THE COLOMBIAN ECONOMY

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ABSTRACT

The purpose of this research is to provide an approximation to the likely effects of the crisis on the Colombian economy and to the effectiveness of policy response. For this, the most relevant transmission channels and policy measures are simulated in the setting of a static computable general equilibrium model (CGE). The results obtained are interesting in their own right and are in line with what could be expected given the information available on the behavior of the Colombian economy. Furthermore, they call into question the effectiveness of governmental intervention as judged by its intended countercyclical effects.

Keywords: International crisis, Counter-cyclical policies, Computable general equilibrium models, Colombia

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1. Introduction

There is widespread interest in analyzing several dimensions of the impact of the international economic crisis. As there has been signs of certain degree of "decoupling", i.e. that emerging economies have become relatively independent from advanced economies' business cycles (flouted for instance in Hebling et al, 2007), one of the areas in which research has focused is the type and degree of affect that these economies are experiencing from the crisis. Analysts, for instance, fear that a prolonged and deep recession in the US may send emerging and developing economies in disarray notwithstanding evidence about decoupling (Kose et al, 2008).

Short of the issue of whether there is decoupling in actuality, a valid and pressing question refers to what is the extent of the impact of the crisis on developing economies. What are its main transmission channels, how do they work through the economic structure, what policy measures have been undertaken, and what is their capability for effectively mitigating the negative effects of the crisis.

The objective of this research is precisely to provide a partial assessment of the impact of the crisis on the Colombian economy and of the policy measures implemented by the government to try to smooth its negative effects. The research is part of a broader effort led by the Poverty and Economic Policy Research Network (PEP), under the project "The Impact of the Crisis on Developing Countries, a CGE Evaluation." This particular piece of work was done under the auspices of the International Food Policy Research Institute (IFPRI).

As implied, the methodology of the project is based on the use of a Computable General Equilibrium (CGE) model, the PEP-1-1 model, so that a common language and methodological perspective is shared among all researchers. For the Colombian study, a 2005 SAM with 12 activities and 12 goods is employed. Two scenarios are run. First, an impact of the crisis scenario, in which the effects of two of the main transmission channels of the crisis are simulated, and second, an adopted policies scenario, in which the main policy measures implemented by the government are put to play simultaneously with the transmission channels. Given the nature of the model, the relative importance of the channels for the particular case of Colombia, and the way they act on the economy, two transmission channels were selected for the simulation: changes in remittances, and changes in the behavior of international trade. On the policy side, one measure is considered for analysis: the higher indebtedness that the government incurred in for increasing investment spending (particularly in infrastructure projects).

The results obtained are interesting in their own right and are in line with what could be expected given the information available on the behavior of the Colombian economy.

The paper is organized as follows. In section 2, some relevant context on the crisis is provided. Section 3 presents and discusses the recent behavior of the main transmission channels in Colombia, and outlines the type of policy response envisaged by the government. Section 4 is devoted to presenting the objectives of the research, the modeling strategy, and the scenarios implemented. Section 5 provides a summary description of the

Colombian economy. Then, results are presented in section 6, and, lastly, some concluding comments are the topic of section 7.

2. Context

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 (2010) during the first ten months of the crisis, world industrial production, trade, and stock markets declined faster than in 1929-1930. The severity of the crisis can be appreciated from subsequent updates of the key forecasts made by the IMF's World Economic Outlook for 2009 as shown in Table 1.

Table 1.   IMF's economic growth forecasts for 2009*

Date	World Output	Advanced economies	Emergent and developing economies
October 2008	3.0	0.5	6.1
April 2009	-1.3	-3.8	1.6
July 2009	-1.4	-3.8	1.5
October 2009	-1.1	-3.4	1.7
January 2010**	-0.8	-3.2	2.1

  *IMF's World Economic Outlook (2009); percentage changes year over year.
**estimated (not projection)

The occurrence of figures slightly better than expected until October 2009 is basically a consequence of the implementation of sizeable stimulus packages adopted by numerous economies, but especially by the developed ones. The global economy is expected to gradually return to positive growth in 2010 (the IMF forecasts 3.9 percent growth at the global level). However, it has been observed that recovery is uneven across regions, spreading from emerging economies to advanced economies, where its pace is expected to be lower than in previous crisis.

In spite of the fact that developing countries experienced a lower growth decline than others, the impact of the crisis on poverty reduction is deemed to be important (Chen and Ravallion, 2009). As their relatively weak integration into the global financial system seemed to have sheltered most developing countries from the financial crisis, for these economies the effects are felt mainly as a real sector crisis. Furthermore, for most of them this may be basically characterized as a "trade crisis" (Evenett and Hoekman, 2009). According to the IMF (2010), world trade volume (goods and services) shrunk 12.3 percent in 2009. The volume of imports by advanced economies and by emerging and developing economies decreased 12.2 and 13.5, respectively, while the volume of exports decreased 12.1 and 11.7. Furthermore, international prices have declined. Oil's price decreased 36.1 percent while nonfuel commodities' prices declined 18.9 percent in average (IMF, 2010).

The macroeconomic impacts of the economic crisis in developing countries largely depend on the magnitude and length of the recession in developed countries. On the other hand, its distributive impacts depend upon the particular economic structure in each case and the

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way it interacts with the international economy. It has been pointed out that the main transmission channels delivering the effects of the crisis from the global to the national economy level are, in the case of developing economies, international trade, capital flows and investment, remittances, and international aid (Decaluwe and Flores, 2009).

3. Transmission Channels and Governmental response in the Case of Colombia

Table 2, below, shows the recent evolution of international aid, remittances, foreign direct investment, and trade in Colombia. The figures cover the period 2000-2008. For each variable, the first row shows the variable level in million US dollars and the second row refers to its value as a percentage of GDP. From there it can be appreciated that international aid is low as compared to the values of the other variables considered. As a share of GDP, it represented 0.28%, as average, during the period 2000-2007, with a peak of 0.56% in 2001. These figures include aid from the US in the framework of the Plan Colombia Program, a cooperation agreement between the US and the Colombian governments for strengthening the fight against illicit crops cultivation and drug trafficking. Around 60% of total funds assigned to the Plan Colombia are devoted to military aid.

Table 2.   Recent behavior of the crisis' main transmission channels in Colombia

	2000	2001	2002	2003	2004	2005	2006	2007	2008
International	154	521	341	281	301	311	315	348	N.A.
aid*	0.16	0.56	0.37	0.31	0.26	0.22	0.19	0.17	
Remittances*	1,578	2,021	2,454	3,060	3,170	3,314	3,890	4,493	4,842
	1.68	2.18	2.64	3.34	2.78	2.29	2.39	2.16	1.99
FDI*	2,436	2,542	2,134	1,720	3,016	10,252	6,656	9,049	10,583
	2.59	2.74	2.30	1.88	2.65	7.09	4.09	4.35	4.35
Exports (goods	16,356	15,296	14,586	15,688	19,868	24,972	28,978	35,061	N.A.
and services)*	17.39	16.47	15.70	17.11	17.45	17.27	17.83	16.87	
Exports	13,158	12,330	11,975	13,129	16,731	21,190	24,391	29,991	37,626
(goods)*	13.99	13.28	12.89	14.32	14.69	14.66	15.00	14.43	15.47
Imports (goods	17,750	19,195	19,487	20,503	24,196	30,410	35,720	43,723	N.A.
and services)*	18.87	20.67	20.98	22.36	21.25	21.03	21.97	21.04	
Imports	11,538	12,834	12,699	13,890	16,748	21,204	26,162	32,897	39,669
(goods)*	12.27	13.82	13.67	15.15	14.71	14.67	16.09	15.83	16.31

*In each case: figures in the first row are million US dollars, and figures in the second row are percentages of GDP.
Sources: National Statistics Office (DANE) and Central Bank (Banco de la República).

As in other developing countries, the significance of remittances has been growing in Colombia. In 2008, remittances were more than threefold their size in 2000 and represented the third largest source of foreign currency, after oil and coal exports (not accounting for FDI). As an average, remittances represented almost 2.4% of GDP during the period 2000-2008.

FDI shows significant and fluctuating values along the time period considered. It has experienced important growth along the last part of the period, reaching in 2008 a value more than six fold the lowest one (in 2003). As average, FDI has concentrated in the mining and oil sectors (48%); followed by the manufacturing industry (19%), the financial

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sector (12%), and the transport and telecommunications sectors (11%). In recent years, the government has aggressively pursued an increase in FDI by means of fiscal stimulus programs. Along the period 2000-2008, FDI has represented the equivalent of 3.6% of GDP.

In terms of its size and share of GDP, trade is by far the biggest of the transmission channels. As average, exports of goods and services represented 17% of GDP during 2000-2008, while imports of goods and services represented 21%. If only trade in goods is considered, both exports and imports represented 29% of GDP between 2000 and 2008. Colombian exports are highly concentrated in a few products and in a few markets. In 2008, exports to the US represented more than 37% of total goods exports, followed by exports to Venezuela (16%) and the European Union (13%). In terms of products, oil represented almost 25% of total exports, while coal exports amounted to more than 13%, oil products almost 8%, chemical products almost 6%, and coffee 5%.

As in many other developing countries, policy response in Colombia has limited to some sort of counter-cyclical measures, mainly related to interest rates management, prioritization of already planned government expending on infrastructure, and precautionary securing of public debt financing.

Measures include the undoing of recent credit tightening by the Central Bank. From April 2006 to the beginning of the second semester of 2008, the Central Bank increased interest rates from 6% to 10%, in the face of increased governmental expending, high foreign capital inflows, and an expansionary credit market. To try to smooth the impact of the crisis on the economy, since the late 2008 and during 2009, the Central Bank decreased the interest rate by 650 basis points, leading to a 3.5% interest rate, the lowest in recent Colombian history.

Also, the Central Bank dismantled the requirement for commercial banks to marginally increase the amount of deposits they have to keep from lending to the public (an additional, marginal, mandatory bank reserve) and the requirement for borrowers in the international market to deposit in the Central Bank a share of the amounts borrowed. These measures were undertaken in the second semester of 2008.

Additionally, the financial regulatory agency (Superintendence of Finance) issued new guidelines regarding management of credit risk on the part of commercial banks and increased the amount of funds banks need to keep for facing unexpected adverse circumstances.

The central government took measures to face the likely decrease in government revenue. It obtained Congress approval to increase the fiscal deficit by 0.6% of GDP (around US$1,430 billion, getting to 3.2% of GDP in total), as well as to postpone expending in about the same amount (shifting expending priority toward programmed infrastructure projects, social programs, and productive incentives programs). Furthermore, a Flexible Credit Line -FCL (worth about US$11,000 million) was contracted in May 2009 with the IMF to secure coverage against adverse balance of payments shocks and for increasing the scope for countercyclical measures.

The IMF's October 2009 review of the Colombian economy under the FCL arrangement (IMF, 2009a) indicated that the global environment had improved as compared with the conditions prevailing at the time the FCL was negotiated. Spreads had narrowed, more for Colombia than for other Latin American economies, the stock market showed clear signs of recovery, and commodity prices were recovering. The external current account deficit for 2009 was expected to stay at 3% of GDP, basically due to a lower than previously expected decline in exports and remittances. The financial system showed resilience as non-performing loans increased marginally (0.6%) in the 12 months running from September 2008 to August 2009, while the fiscal deficit increased at the expected pace.

In sum, the IMF's report showed a general situation better than expected at the beginning of 2009. This picture is confirmed as judged by the press release following a new IMF's review held in February 2010. According to it "The Colombian economy is showing signs of recovery [and] Economic policies before and after the global crisis were appropriate to ameliorate the impact on Colombia. The central bank lowered its policy rate by 650 basis points since late 2008 and fiscal policy was countercyclical. The flexible exchange rate and the sound financial system were also instrumental in mitigating the effects of the external shocks." (IMF, 2010)

Figures available on the behavior of the main transmission channels show that although better than initially expected, the impact of the crisis is significant. There are no readily available figures on the behavior of international aid in 2008 and 2009. However, as the bulk of aid comes from the Plan Colombia Program and it has been kept in place with relatively minor budgetary adjustments, it is reasonable to expect that international aid has been stable during these two years.

On the other hand, remittances decreased along most months during 2009, as compared to 2008. Only February and November showed remittances levels slightly above the figures registered in the same months in 2008. The biggest decrease is found in July, when its value dropped 23% with respect to the same month in 2008. In total, in 2009 remittances declined 14.4%, in current US dollars.

The behavior of FDI during 2009 was as follows. As compared with the same period a year before, FDI declined almost 21% in the first quarter while a recovery is found during the second quarter in which an increase of 11.1% is registered. The third quarter of the year shows a marked slump with a decline of 50.7%, while the fourth quarter goes down even deeper with a 64.6% decline. For the whole year FDI fell almost 31.5%.

While currently there are no figures available for international trade in services in 2009, trade in goods showed a significant declined in value terms. In current US dollars, Colombian exports decreased 12.7% and imports declined 17.1%. In terms of volumes, exports increased 9.2% while imports decreased 6.6%. This means that, aside trade shrinkage in value, the Colombian economy experienced deterioration in its terms of trade. While, in aggregate, export prices declined 20%, import prices declined 11.2%.

The behavior of real GDP along 2009 can be characterized as follows. The first three quarters of the year showed year on year declines of 0.5%, 0.3%, and 0.2%, respectively, and quarter on quarter increases of 0.1%, 0.8%, and 0.4%. In turn, the fourth quarter showed a significant recovery. It registered a 2.5% increase on a year on year basis and a 1.1% increase on a quarter on quarter basis. The aggregate figure for the year turned out to be a 0.4% increase in GDP. The sectors with the highest contributions to this increase were construction, mining, and financial services.

4. Objective, Modeling Strategy, Data, and Scenarios

The purpose of this research is to provide an approximation to the likely effects of the crisis on the Colombian economy and to the effectiveness of policy response. For this, the most relevant transmission channels are considered in the setting of a static computable general equilibrium model (CGE). Given the static nature of the model and the relative importance of transmission channels in the case of Colombia, only the behavior of remittances and international trade are considered in the simulations.

The static Poverty and Economic Policy standard model (PEP-1-1) by Decaluwe et al (2009) is used here. Minor changes were made to the model to adjust it to the 2005 SAM available for Colombia. The model has two production factors: capital and labor. The latter is divided in four types: rural unskilled, rural skilled, urban unskilled, and urban skilled. Each activity in the model uses both production factors. The SAM was aggregated to 12 activities and 12 commodities (the original SAM has 59 activities and 59 commodities) to emphasize the trade structure of the economy. Activities produce more than one commodity and several commodities are produced by more than one activity. Households are break down in income deciles so as to have a deeper look at the distributional consequences of the crisis. No further discussion of the model is pursued here, as only minor adjustments were made to PEP-1-1 and its structure is described in detail in Decaluwe et al (2009).

As mentioned above, only remittances and trade were chosen among the transmission channels for simulation. International aid was disregarded as a transmission channel of importance given that its size is relatively small for the economy. Furthermore, the bulk of aid comes from the implementation of the Plan Colombia which is relatively independent of the crisis in the sense that its political nature and pre-committed levels (to certain point) tend to isolate it from the vagaries of the crisis. Admittedly, there are aid programs that are likely to suffer from budgetary reductions driven by the crisis. However, they tend to be relatively small and highly focused on certain population groups. This is what happens, for instance, with programs run by the World Food Program that caters vulnerable groups, mostly displaced population, that tend to be marginal to markets behavior.

FDI is potentially an important channel in the transmission of the effects of the crisis. However, in the context of a static model its role is basically one of improving (or worsening) the ability of the economy to cover a potential deterioration in the current account in the face of trade changes. As the IMF's October 2009 review of the Colombian economy states, the composition of the Colombian capital account shifted in a way favorable to the economy. Public sector roll-over rates were higher than anticipated,

including bond emissions by public sector enterprises, and the medium-term roll over rates for the private sector behaved according to expectations and have been partly used for foreign assets accumulation. As a consequence, the IMF estimated that FDI will largely finance the current account balance. In light of this, it was decided that shocking FDI was not a reasonable proposition for our purposes.

As mentioned, in current US dollars, remittances decreased by 14.4% (about US$700 million) between 2008 and 2009. Contrary to what may be expected, remittances do not necessarily benefit the most the lower income households. As international migration is costly and employment opportunities abroad are positively correlated with relative human capital, migrants from households in the lowest income levels are scarcer than those belonging to higher income levels when the prevalence of migration is relatively low (Mckenzie and Rapaport, 2004; quoted in Hernandez, 2008). Furthermore, migrants' capability for sending remittances increases with their human capital and this may translate in higher remittances levels to higher income households. According to Gaviria (2004), Colombian migrants to the US have at least three more years of schooling than their counterparts in Colombia and earn twice as much. Although lower income migrants have the more to gain, higher income migrants have the legal and economic means to migrate.

According to Hernandez (2008) estimations, the three lowest household income deciles get 2.2% of total remittances, while the following three get 14.4%, income deciles 6 to 9 get 38%, and the top 10% of households gets more than 45% of total remittances. Urrutia (2003) posits that remittances tend to be countercyclical due to the fact that are destined to cover the beneficiary household's subsistence expenses. It also claims that migrants tend to increase hours worked and remit more during periods in which recipient households experience income shocks. Other related evidence provided by Hernandez (2008) tends to support also the hypothesis that remittances income can be regarded as part of the recipient household's permanent income.

In relative terms, trade is the biggest of the crisis transmission channels and presumably the one that may have the largest impacts. As mentioned, for most developing countries it is deemed that the international crisis is felt mainly as a trade crisis. In the case of Colombia exports and imports contracted in value in 2009, but exports increased in volume (a fact determined by the composition of Colombian exports) while imports decreased in volume. Activities in the model are aggregated in such a way as to better reflect the composition of Colombian trade and trade impacts. Table 3 shows the sectoral structure of Colombian trade in terms of value and volume shares for export and import trade.

Table 3.   Structure of Colombian Trade in Goods 2008

Sector	Exports. Share in:		Imports. Share in:	
	Value	Volume	Value	Volume
Agriculture	13,5	0,9	6,2	27,9
Coal	13,4	68,7	0,0	0,0
Oil	24,7	16,7	0,6	1,3
Minerals	6,5	2,0	0,5	4,6
Processed oil	7,7	6,4	3,9	8,7
Chemical products	7,5	1,4	19,5	20,3
Manufacturing	20,7	3,6	25,2	30,8
Machinery and equipment	4,4	0,2	33,6	4,3
Transport equipment	1,5	0,1	10,0	2,2

Source: author's calculation based on data from the Ministry of Trade, Industry, and Tourism

Agriculture has significant participation in both export and import trade. Agricultural exports are dominated by coffee, cut flowers and bananas, while agricultural imports consist mainly of cereals. Coal is the second largest (individual) Colombian export in value and the largest in volume. Oil is the largest Colombian export (as a model sector and individually considered) in value and the second largest in volume. Minerals include nickel, emeralds, and other minerals not specified. Processed oil is the fourth largest (individual) Colombian export and the fifth largest (individual) import. Chemical products are significant as both an export and an import item. On the export side, these exports are basically aimed at the regional market, notably the Andean Community. The manufacturing sector is a wide combination of subsectors. It includes all agroindustrial activities, as well as textiles, apparel, paper, editorial products, shoes and leather products, plastic products, metallurgy and metallic products, and other manufacturing not specified. Machinery and equipment is, by far, the largest Colombian import. It comprises machinery for general use (motors, turbines, pumps, elevators, and furnaces) as well as machinery for specific purposes (agriculture, metallurgic, mining, food and beverages, textiles, and domestic appliances), and other machinery (office equipment, computers, electric equipment, communications equipment, medical and optical equipment, and watches). Lastly, transport equipment is the third largest (individual) Colombian import.

Two scenarios are implemented for reaching the proposed objectives. First, an impact of the crisis scenario, and second an adopted policies scenario. In what follows both are discussed in turn.

The impact of the crisis scenario is run on the lines depicted above. The economy is shocked through "observed" changes in remittances and exports. Remittances are lowered by 14.4% with respect to the benchmark, corresponding to the behavior actually observed. However, since there is no information on the way this drop is shared among recipient households (and there is no data to make any inference about it), it is assumed that all household types are affected in the same proportion. As implied above, remittances income is treated as part of households' permanent income and changes in this income source affect the whole set of consumption/savings decisions.

On the other hand, export trade is shocked both in terms of exported volumes and in prices. Actual information is used for determining the size of the shocks. Data from the Ministry of Trade, Industry, and Tourism is used to estimate changes in exported volumes for the sector groupings employed in this research. Regarding prices, in view that there is no available information on international prices at the level of aggregation needed, it was decided to assume that in all cases Colombia acts as a small economy and that changes in implicit prices reflect to an acceptable degree changes in international prices. As this approach may entail difficulties (for instance, it may happen that the gap between FOB and international prices changes due to market conditions and that price transmission is less than perfect) it seems reasonable to use the behavior of implicit FOB prices as a proxy for changes in international prices, especially given that price changes must correspond to the particular basket of products at the interior of each sector grouping (a condition in practice impossible to achieve using available data).

Therefore, changes in export volumes and values were used to estimate changes in implicit FOB prices, and the latter are used as proxies for changes in international prices. This has the additional advantage that as export volumes and values are constructed from customs data, they reflect the behavior of price fluctuations along the whole year, instead of applying a "flat", uniform, price change to the aggregate of monthly exports. Table 4 shows the percentage changes in trade volumes and prices that are used to shock the economy, for each sector.

Table 4.   Percentage Changes in Export Volumes and (Estimated) Prices for Colombia during 2009

Sector	Exports		Imports
	Change in Volume	Change in Price	Change in Price
Agriculture	3,1	-13,9	-27,0
Chemical products	14,0	-25,6	-10,9
Coal	8,1	-0,7	-24,5
Coffee	-23,7	6,8	5,1
Machinery and equipment	-19,6	5,7	14,9
Manufactures	-1,9	-31,8	-11,4
Minerals	-30,3	38,5	-35,2
Oil	32,1	-52,7	76,8
Processed oil	-14,1	-12,7	-57,2
Transport equipment	-43,2	-11,6	-2,3

Source: author's calculation based on data from the Ministry of Trade, Industry, and Tourism

As exports tend to concentrate in a few firms it is unlikely that they can easily switch production between exports and the domestic market in the short-run. Furthermore, in several cases product quality differs between these two markets. In light of this, it is assumed that there are short-term rigidities for switching production between supply for the domestic market and exports. A CET elasticity of 0.5 is used to reflect such rigidity. On the importers side, a CES elasticity of 2 is used for substituting domestic production for imports, as it is deemed that in the demand side substitutability is higher, even in the short-

run. Final demand parameters (LES) are calibrated according to household survey data, using the same survey on which the micro-SAM was constructed.

Regarding factor markets, capital is assumed to be sector specific as a short-term scenario is run. As for labor, a low elasticity of substitution among labor types is assumed. The Colombian economy has a relatively high and stable unemployment rate. Between 2001 and 2008, the annual average unemployment rate was 13.1% with a coefficient of variation of 0.1. Between December 2008 and December 2009 unemployment increased 0.7% (from 10.6% to 11.3%). Being unemployment a "structural" feature of the Colombian economy and having increased marginally (in aggregate terms) during 2009, labor markets are modeled as wage flexible since most adjustment may be expected to come from wages and not from greater unemployment (given the large size of the informal sector).

The adopted policies scenario aims at representing the most important policy responses adopted before the crisis. As a summary, policy response in Colombia rested on: (a) an important reduction in interest rates charged by the Central Bank (a 650 basis points total reduction), and (b) a counter cyclical fiscal policy, based on a deficit increase incurred in for avoiding reductions in investment. The Colombian public debt increased to 4.6% of GDP during 2009 (the public external debt increased 255.4% and the public internal debt increased 0.15%), allowing for an increase in public sector demand of 10.2%. From these measures, the first is less amenable to be simulated with the kind of model used here and there is no readily available information on the real drop in commercial interest rates that was induced by the Central Bank. In light of this, it was decided to model only the impact of the second policy.

For this, it is assumed that public operating expenses (current government expenses on goods and services) are kept constant while Rest of the World savings is allowed to expand in a predetermined proportion, to reflect the increase in public foreign debt. In turn, the increase in Rest of the World savings is mainly channeled to investment in infrastructure so as to capture the 10.2% increase in government investment in this sector. These shocks are added to the ones documented above to reflect the impact of the crisis and the same closure rules are followed.

5. Stylized Facts on the Colombian Economy

As shown in Table 5, in terms of value added, the Colombian economy is overwhelmingly a services economy. The services sector[1] accounts for more than 61% of total value added and is followed in importance by the manufacturing (near 11%), and agricultural sectors (more than 9%). Value added represents almost 64% of the total value of the services sector. However, the highest shares of value added in total sectoral value are found in the minerals, coffee, and agricultural sectors. On the opposite side, the lowest shares of value added in total value belong to transport equipment, machinery and equipment, and manufactures.

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[1] It includes domestic services, commerce, reparation and maintenance, hotels, transport, postage, financial services, restaurants, rentals, education, social services, recreation, and public administration.

Regarding its contribution to investment (gross fixed capital formation and inventories), the infrastructure sector is by far the largest, with a 61.4% share. It is followed by machinery and equipment and transport equipment, with 20.6% and 8.5%, respectively. Lastly, the sectors with the largest capital-labor ratios are coal, oil, and chemical products. The first two are among the largest contributors to Colombian export value. On the other side, the sectors with the lowest ratios are agriculture, coffee, and minerals.

Table 5.   Sectoral composition of value added, trade, and investment in Colombia. 2005

Sector	Value added share	Value added share in total value	Investment*	Capital-labor ratio
Agriculture	9,3	68,1	1,5	0,06
Chemical products	1,8	31,4	0,4	2,40
Coal	1,4	65,4	0,1	6,61
Coffee	1,5	76,4	-0,2	0,06
Infrastructure	6,2	44,2	61,4	0,86
Machinery and equipment	0,6	29,7	20,6	0,88
Manufactures	10,7	30,5	4,4	0,97
Minerals	1,7	83,7	0,6	0,36
Oil	3,2	64,3	0,1	5,39
Processed oil	1,8	39,3	0,1	2,05
Services	61,4	63,7	2,7	0,57
Transport equipment	0,3	13,5	8,5	1,24

*includes gross capital formation and changes in inventories
Source: Colombian 2005 SAM

Table 6 shows the sectoral composition of labor demand by labor type. From there, it can be appreciated that the services sector is the largest employer of rural skilled workers and urban workers. Employment of rural skilled workers concentrates around the services sector (more than 71% of total employment for this labor type) and the agricultural sector (more than 20%). In turn, rural unskilled workers find employment the most in the agricultural sector (more than 66%) and then, with small differences, in the coffee and services sectors. Almost 79% of urban skilled workers are employed in the services sector, while more than 62% of urban unskilled workers find employment there too. The second largest employer of urban skilled workers is the manufacturing sector, followed by the agricultural and the infrastructure sectors. Finally, the second largest employer of urban unskilled workers is the manufacturing sector followed, again, by the agricultural and the infrastructure sectors.

Table 6.   Sectoral composition of labor demand by labor type in Colombia. 2005

Sector	Sectoral share in labor demand for:			
	Rural skilled workers	Rural unskilled workers	Urban skilled workers	Urban unskilled workers
Agriculture	20,3	66,2	4,3	9,9
Chemical products	0,3	0,1	1,3	0,7
Coal	0,0	0,2	0,3	0,3
Coffee	2,2	10,7	0,7	1,4
Infrastructure	3,2	2,0	4,2	7,7
Machinery and equipment	0,0	0,0	0,6	0,6
Manufactures	2,9	2,9	6,0	13,5
Minerals	0,0	6,7	0,0	2,7
Oil	0,0	0,1	1,3	0,5
Processed oil	0,0	0,0	2,0	0,3
Services	71,2	11,1	78,9	62,2
Transport equipment	0,0	0,0	0,3	0,2

Source: Colombian 2005 SAM

From a sectoral perspective, labor is predominantly rural unskilled and urban unskilled, in this order, in the agricultural and coffee sectors, while it is urban unskilled and rural unskilled in the minerals sector. It is predominantly urban skilled and urban unskilled, in this order, in the chemical products, oil, processed oil, transport equipment, and services sectors. It is predominantly urban unskilled and urban skilled in the infrastructure and manufacturing sectors. Labor is approximately (and predominantly) balanced between urban unskilled and urban skilled types in the coal, and machinery and equipment sectors. There are no sectors whose predominant labor type is rural skilled.

Finally, it is useful to have an idea about the composition of households' income. Table 7 shows the relevant information. From there, it is clear that there is high income inequality in Colombia. Households in decile 10 earn almost 37 times the income that households in decile one get. The figure reduces to almost seven times when decile 10 income is compared to the joint income of households in deciles one to three. As for the composition of income, labor is the main income source for all household types. Its contribution ranges from 86.4% for households in decile one to 61.5% for households in decile 10, decreasing monotonically as we move from low income deciles to high income deciles. Capital income shows the lowest contribution to total income across households. It is the highest for high income households (9% for decile 10 households) and the lowest for low income households (0.8% in the decile one). Lastly, transfer income is the second largest income source making up, as average, for almost 22% of households income. As in the case of capital income, there is the tendency for transfer income to increase as we move from low income to high income households. Remittances income is relatively low for all household types. As a proportion of transfer income, it represents 11.5% as average, showing the lowest share in the case of households in decile one and the highest shares for households in deciles five and six.

Table 7.   Composition of households' income in Colombia. 2005

Household decile	Share in total income	Share of income from:			Share of remittances in transfer income
		Capital	Labor	Transfers	
1	1,2	0,8	86,4	12,8	7,1
2	2,2	1,1	85,8	13,1	9,0
3	3,0	1,5	83,1	15,4	8,2
4	4,0	1,2	79,2	19,6	9,4
5	5,0	1,6	78,4	20,0	16,2
6	6,2	1,3	75,6	23,1	16,8
7	8,0	2,1	74,2	23,7	11,5
8	11,4	2,9	66,9	30,1	13,8
9	16,1	3,3	65,6	31,2	11,3
10	43,0	9,0	61,5	29,5	11,8

Source: Colombian 2005 SAM

6. Simulations Results

6.1   Impact of the crisis scenario

Results from the impact of the crisis scenario are discussed below. Table 8 presents changes in quantities exported and in export values arising as a consequence of the trade shock. As can be appreciated, the direction and magnitude of changes follow the pattern imposed by the trade shock. In general, coal, coffee, machinery and equipment, mineral, and services show increases in quantities exported. With the exception of machinery and equipment this is also the direction that changes in export value have for this set of sectors. However, FOB prices decline for most of these sectors and positive changes in export value are due to more than offsetting increases in quantities exported. The only cases in which FOB prices increase correspond to coal and minerals. Agriculture shows decreases in quantities exported and export value. The rest of sectors (chemical products, manufactures, oil, processed oil, and transport equipment) show decreases in both quantities exported and exported value.

These changes are in consonance with the size and direction of the shocks imposed.[2] In terms of impact on the economy, the most significant changes are those belonging to the sectors with the largest trade shares: manufactures, oil, coal, and agriculture. In total, quantities exported decrease 3.4% and exported values decrease 42.8%.

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[2] It must be remembered that services trade was not shocked due to lack of data.

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Table 8.   Percentage changes in traded quantities and trade values. Scenario impact of the crisis.

Sector	Quantity exported	Export value	Quantity imported	Import value
Agriculture	-1.1	-13.0	18.3	-11.9
Chemical products	-3.8	-22.1	-5.2	-16.1
Coal	6.6	6.6	21.8	-6.9
Coffee	20.1	2.2	-26.3	-22.2
Machinery and equipment	10.2	-0.5	-29.6	-22.8
Manufactures	-11.9	-36.6	-8.3	-19.3
Minerals	26.2	29.9	-22.0	-47.9
Oil	-16.0	-50.2	-80.4	-67.0
Processed oil	-10.2	-23.3	83.7	-16.6
Services	9.4	4.6	-26.8	-26.8
Transport equipment	-26.3	-42.8	-21.1	-23.9

Source: model simulation

Table 8 also shows similar information for the case of imports. As international import prices are exogenous and there are no changes in tariffs or other taxes affecting imports, changes in CIF prices (with respect to international prices) arise only as a consequence of movements in margins prices. Most sectors tend to show decreases in imported volumes as well as in imported values. The exceptions to this behavior are agriculture, coal, and processed oil, whose imported quantities increase. As only coffee, machinery and equipment, and oil show positive price shocks, the general situation for these products is that changes in quantities imported determine changes in import values. All sectors register declines in import values.

The broad changes in the import side are determined by machinery and equipment, manufactures, chemical products, and transport equipment. As an aggregate, quantities imported decline by 12.7%, while import values decline 23.9%.

The third piece of information fitting in this description is supply of domestic products for the domestic market. Table 9 presents the relevant data. Most sectors show declines in quantities supplied and market value. Only coffee shows increases in both variables, while machinery and equipment, and services show increases in quantities and declines in market value, reflecting declining prices. The structure of the domestic market for domestically produced goods is dominated by the services sector. It accounts for almost 58% of total domestic demand, followed by manufactures (18.8%), infrastructure (8.9%), and agriculture (6.6%); the rest of sectors account for the remaining 7.8%. Therefore, changes in supply to the domestic market are determined by the behavior of these four sectors. As a whole, quantity supplied for the domestic market decreases 1.1%. Lastly, market value decreases 15.5%.

Table 9.   Percentage changes in quantities supplied to the domestic market and market values. Scenario impact of the crisis.

Sector	Quantity supplied	Value
Agriculture	-4.4	-24.1
Chemical products	-0.2	-14.5
Coal	-2.3	-5.8
Coffee	18.7	14.9
Infrastructure	-16.5	-44.9
Machinery and equipment	8.8	-0.9
Manufactures	-2.6	-18.6
Minerals	-6.1	-16.1
Oil	-3.5	-35.5
Processed oil	-20.0	-54.8
Services	2.8	-7.6
Transport equipment	-17.8	-31.9

Source: model simulation

A general comment is in order with respect to the behavior of the variables described above. Sectors with high exposition to trade, say more than 50% of exports as a proportion of domestic demand or more than 50% of imports as a proportion of domestic demand[3], tend to show changes in trade variables that are commensurate with the size of the trade shocks and this generates relatively large changes in supply to the domestic market (as it has relatively low shares as a production destiny). Sectors with the lowest expositions to trade tend to show smaller relative changes in domestic supply. However, the size of changes in supply to the domestic market depends upon the size of the trade shock.

As the agricultural sector is the largest employer of rural unskilled workers and output of the sector shrinks, wages tend to fall. The other sectors important for demand of this labor type (services and coffee, which make up short of a third of demand by agriculture) show increases in output ameliorating the negative impact on wages. As a result, wages for this labor type fall almost 18%. Regarding rural skilled labor, in spite of the fact that the largest demander of this labor type (services) increases output (in 2.9%), wages fall. The reason is twofold. First, prices for services decline by a bigger proportion making output value shrink. Second, the second largest employer of rural skilled labor (agriculture) decreases in output. The fall in wages is in the order of 10%.

On the urban side, the following results are attained. Output of the two largest employers of urban unskilled workers (services and manufactures) move in opposite directions. However, in value terms both sectors decline inducing a 17.6% fall in wages. Lastly, the behavior of urban skilled labor's wages is largely determined by the behavior of the services sector (which demands almost 79% of this labor type). As the value of this sector's output decreases, wages for urban skilled workers do the same; they decrease by 14.4%.

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[3] On the export side these are coal, coffee, minerals, oil, and processed oil. On the import side they are: chemical products, machinery and equipment, and transport equipment.

Table 10 shows percentage changes in labor demand by sector and labor type. As partly mentioned above, the most important changes regarding rural unskilled labor are those arising in agriculture and services. The dynamics essentially consists in that the agricultural and infrastructure sectors expel workers while the coffee, minerals, and services sectors absorb them. In the case of rural skilled workers, the services sector increases its absorption of this labor type while the agricultural sector expels workers. Changes shown by the infrastructure and coffee sectors are sizeable in relative terms, but both sectors have small employment shares for this type of labor (as shown in Table 6 above).

Table 10. Percentage changes in labor demand by sector. Scenario impact of the crisis.

Sector	Rural unskilled	Rural skilled	Urban unskilled	Urban skilled
Agriculture	-5.8	-7.5	-5.8	-6.6
Chemical products	-4.7	-6.4	-4.7	-5.4
Coal	53.7		53.6	52.4
Coffee	25.7	23.4	25.7	24.7
Infrastructure	-29.3	-30.6	-29.3	-29.8
Machinery and equipment	12.9		12.8	12.0
Manufactures	-6.8	-8.5	-6.9	-7.6
Minerals	18.9		18.8	17.9
Oil	-58.5		-58.5	-58.8
Processed oil			-39.0	-39.4
Services	5.1	3.2	5.0	4.2
Transport equipment	-43.1		-43.1	-43.5

Source: model simulation

In the case of urban sector workers, the dominant force is the behavior of the services sector. As its output increases, so does its demand for both unskilled and skilled labor. The infrastructure, agriculture and oil sectors are the main providers of unskilled labor for the services sector. In the case of skilled labor, the main sources of workers flowing to the services sector are infrastructure, oil, processed oil, and agriculture.

Firm's income decreases 17.85% and all components of firm's income contribute to this decrease. Capital income falls 18.9% while transfer income decreases 16.3%.

A similar situation happens in the case of households' nominal income. Total income for all household types decreases and the same is true for each of their income sources. Income losses decrease as we move up in the income distribution ladder. Therefore, it is lower income households who suffer the biggest relative income losses, showing a regressive effect arising from the crisis. Labor income, which is the most important income source among all household types, also shows the biggest relative decreases among low income households. Meanwhile, transfer income exhibits a progressive behavior. Its losses tend to be larger for high income households. However, this result must be taken with care since it depends heavily on the assumption that remittances drop in the same proportion for all household types. The reader is referred to the annex, where results from a "sensitivity analysis" are performed around this assumption. They show that had different assumptions

been made about the distribution of this shock among households, it is unlikely that the nature of the results presented here would be different.

Table 11 shows percentage changes in households' nominal income. As follows from there, changes in labor income largely determine the outcome for total income. This is so not only due to the relative importance of labor income, but also because there is relatively low variation among changes for all income sources.

Table 11. Percentage changes in households' nominal income. Scenario impact of the crisis.

Decile	Total income	Capital income	Labor income	Transfer income
1	-17.5	-18.9	-17.7	-15.9
2	-17.4	-18.9	-17.7	-15.8
3	-17.4	-18.9	-17.6	-16.1
4	-17.2	-18.9	-17.5	-15.7
5	-17.1	-18.9	-17.4	-15.8
6	-17.0	-18.9	-17.3	-16.0
7	-16.8	-18.9	-17.0	-16.1
8	-16.4	-18.9	-16.7	-15.6
9	-16.1	-18.9	-16.0	-15.9
10	-15.7	-18.9	-15.0	-16.2

Source: model simulation

The trade shock, as far as prices concerns, mainly consists of relatively sizeable decreases that induce price reductions in the economy. At the consumer level, prices for all goods but machinery and equipment fall in the range from 4.4% to 38.8%. In all, the consumer price index falls 14.5%, ameliorating the impact of the decrease in nominal income. As a consequence, real income drops in the range from 1.2%, for households in decile 10, to 3%, for households in decile one. These effects seem to be perfectly regressive as low income households systematically lose more than high income households.

However, if a consumer price index is constructed for each household type, reflecting differences in their consumption baskets, a different picture emerges. In this case, it follows that households in the lowest income levels lose the less as compared to households in higher income levels. This, however, does not happen in a systematic way, as households in intermediate income brackets tend to face similar levels of loses and these are higher than the corresponding to low and high income households. In this sense, the effects of the crisis (as modeled here) run against all household types, but tend to be harsher for middle income households. Table 12 shows the relevant figures.

Table 12.   Percentage changes in households' real total income. Scenario impact of the crisis.

Decile	Deflated by general price index	Deflated by own decile price index
1	-3.0	-1.0
2	-2.9	-1.7
3	-2.8	-2.0
4	-2.6	-1.9
5	-2.5	-1.9
6	-2.5	-1.9
7	-2.3	-2.0
8	-1.9	-1.8
9	-1.6	-1.6
10	-1.2	-1.4

Source: model simulation

Governmental income also decreases. It does so by 18.1% and all sources of governmental income contribute to this decrease, as shown in Table 13, leaving their composition almost unchanged. On the expenditure side, transfers made by the government decrease 14.5% while government expending in goods and services remains constant (it is exogenous in the model). As a result, government savings turn negative, moving from a positive 5.8% of total governmental income to -6% of the new total governmental income.

Table 13.   Percentage changes in government's income. Scenario impact of the crisis.

Item	Change (%)
Total income	-18.1
Capital income	-18.9
Income taxes (households)	-16.0
Income taxes (firms)	-18.9
Taxes on production	-20.3
Taxes on products	-20.7
Import taxes	-18.8
Transfers	-16.3

Source: model simulation

Lastly, the GDP deflator falls 17.2%, leading to a nil real change in GDP (GDP at basic prices falls 17.3%).

6.2   Adopted policies scenario

As mentioned, the adopted policies scenario adds to the impact of the crisis scenario the main features of policy intervention for ameliorating the negative effects arising from the crisis. In this case, policy intervention essentially rests on two pillars: higher foreign debt incurred in by the government and higher government spending in infrastructure. The main characteristic arising from this scenario is that, compared to the impact of the crisis

scenario, it smoothes the (negative) price response to the crisis. Hence, it tends to lead to a "softer" adjustment of the economy with the implications that will be made evident below.

Regarding trade impacts, policy intervention does not generate significant changes in terms of their size with respect to the impact of the crisis scenario, as can be appreciated from Table 14. Quantities exported decrease slightly more when there are decreases and increase less when there are increases. The same behavior is observed for export values. In the case of quantities imported, imports decrease less when there are decreases and tend to increase more when there are increases (although this is not a generalized behavior as can be appreciated in the case of coal). A similar trend is observed for import values. As import values decrease for all sectors, in most cases the decrease is smaller when there is policy intervention. However, this is not true in the cases of coal, machinery and equipment, oil, and transport equipment.

Table 14.   Percentage changes in traded quantities and trade values. Scenario policy response.

Sector	Quantity exported	Export value	Quantity imported	Import value
Agriculture	-1.9	-13.4	20.5	-10.1
Chemical products	-4.7	-22.4	-4.3	-15.2
Coal	6.0	6.3	17.5	-10.1
Coffee	18.3	1.5	-19.3	-14.8
Machinery and equipment	7.0	-2.0	-31.8	-25.1
Manufactures	-12.6	-36.8	-5.4	-16.6
Minerals	24.5	29.0	-13.9	-42.4
Oil	-16.4	-50.3	-80.5	-67.1
Processed oil	-10.8	-23.6	83.8	-16.4
Services	8.3	4.1	-24.9	-24.9
Transport equipment	-27.8	-43.4	-22.6	-25.3

Source: model simulation

The direction of these changes is consistent with two facts. First, when there is policy intervention export and import prices decrease less when they decrease and increase more when they increase, due to the fact that higher foreign savings partly finance changes in the current account balance. In fact, measured in relative terms, the current account deficit in the base year is equivalent to 15.6% of total trade, while it rises to 15.8% under the impact of the crisis scenario, and to 16.3% under the policy response scenario. Second, the boost in demand for infrastructure helps in lowering the effect of the crisis on domestic prices, mainly those belonging to the sectors that provide inputs to the infrastructure sector. As an average, prices for composite products (the CES combination of domestically produced and imported goods) go down by 17% under the impact of the crisis scenario and by 15.9% under the policy response scenario.

Table 15 shows percentage changes in quantity supplied to the domestic market and in its market value. As before, percentage changes arising from the policy response scenario do not differ much with respect to those arising from the impact of the crisis scenario. The main exception to this is found in the obvious case of infrastructure. Domestic supply of

infrastructure decreases 7.4% less when there is policy intervention, reflecting the priorities that the government assigned for expending purposes. For most of the remaining sectors the decreases are slightly higher and the increases are slightly lower, in a consistent way with the behavior of trade flows and prices.

Table 15.   Percentage changes in quantities supplied to the domestic market and market values. Scenario policy response.

Sector	Quantity supplied	Value
Agriculture	-4.7	-20.4
Chemical products	-0.8	-13.4
Coal	-3.6	-18.7
Coffee	19.0	3.4
Infrastructure	-9.1	-24.0
Machinery and equipment	4.9	-6.5
Manufactures	-2.5	-15.1
Minerals	-5.2	-41.9
Oil	-4.0	-28.0
Processed oil	-20.5	-45.9
Services	2.3	-12.4
Transport equipment	-19.8	-23.1

Source: model simulation

Changes in market value tend to vary in a higher degree than under the impact of the crisis scenario. The cases of infrastructure, coal, coffee, and mining are noticeable. In the case of infrastructure changes are due, as mentioned, to increased government expending, while in the other cases it is the higher exposition of these sectors to international trade what drives the results (as domestic supply in these sectors is relatively small).

The above implied changes in sectoral production determine the way labor demand changes at the sectoral level. Table 16 shows the relevant figures. With respect to rural unskilled workers demand, percentage changes for the two main demanders (agriculture and services) are almost the same as those found under the impact of the crisis scenario. However, there is an expected redistribution of this type of labor among other sectors. In particular, as compared to the impact of the crisis results, infrastructure increases its demand of this labor type at the expense of other sectors. As for rural skilled labor, comparing with the impact of the crisis' outcome, the main feature of the results is that the largest demanders (services and agriculture) show a marginally lower increase in demand for this labor type. This is due to the fact that the infrastructure sector (the third largest demander of this labor type, although well below the first two) increases its demand, coming from a reduction of 30.6% to a reduction of 17.7%.

Table 16.   Percentage changes in labor demand by sector. Scenario policy response.

Sector	Rural unskilled	Rural skilled	Urban unskilled	Urban skilled
Agriculture	-5.8	-7.6	-6.4	-6.6
Chemical products	-6.6	-8.3	-7.2	-7.4
Coal	48.3		47.3	47.0
Coffee	24.4	22.1	23.6	23.3
Infrastructure	-16.1	-17.7	-16.7	-16.9
Machinery and equipment	6.6		5.9	5.7
Manufactures	-6.6	-8.3	-7.2	-7.4
Minerals	18.1		17.3	17.1
Oil	-60.2		-60.4	-60.5
Processed oil			-40.3	-40.4
Services	4.6	2.6	3.9	3.7
Transport equipment	-46.1		-46.4	-46.5

Source: model simulation

Regarding urban labor, the difference between the results attained under the scenario impact of the crisis and this scenario, is that urban unskilled labor is redistributed from all sectors in the economy towards the infrastructure sector. Therefore, when there is policy intervention, demand for this labor type decreases more when there are decreases and increases less when there are increases for all sectors but infrastructure. For the latter, demand for this labor type decreases less than before (a difference of 12.6 percentage points). With respect to urban skilled labor, almost the same behavior is observed. Demand for this labor type decreases for most sectors, as compared to what is observed under the impact of the crisis scenario. In the cases of infrastructure and manufactures it increases. For the first, demand falls almost 17% (while it falls almost 30% in the previous scenario) and for the second 7.4% (the decrease under the previous scenario was 7.6%).

Accordingly, nominal wages fall for all labor types. Wages for rural unskilled workers fall 17.6%, for rural skilled workers 9.4%, for urban unskilled workers 14.8%, and for urban skilled workers 14%. Therefore, as in the former case, nominal wages for unskilled workers (rural and urban) fall the most, but now wage declines are lower than before for all labor types. Nonetheless, the decrease in wage loses is modest for all labor types but urban unskilled workers. For the former, wages decrease between 0.3% and 0.5% less and for the latter the decrease is 2.8% less. This clearly is a consequence of the lower decrease in demand for this labor type in the infrastructure sector.

Changes in wages importantly weight in the behavior of households' nominal income, as labor income is their most important earnings source. Table 17 shows percentage changes in households' nominal total income and in their components.

Table 17.   Percentage changes in households' nominal income. Scenario policy response.

Decile	Total income	Capital income	Labor income	Transfer income
1	-16.4	-17.4	-16.7	-14.7
2	-16.0	-17.4	-16.2	-14.6
3	-15.8	-17.4	-15.9	-14.9
4	-15.4	-17.4	-15.6	-14.6
5	-15.2	-17.4	-15.3	-14.7
6	-15.2	-17.4	-15.2	-14.9
7	-15.0	-17.4	-15.0	-15.0
8	-14.8	-17.4	-14.8	-14.5
9	-14.7	-17.4	-14.5	-14.8
10	-14.7	-17.4	-14.1	-15.1

Source: model simulation

Policy intervention lowers the decline in households' total income across the board. The highest improvements locate towards middle income households, making the changes less systematically regressive. Capital income decreases less than before, due to the fact that now the rental rate of capital decreases less. As follows from changes in wage levels, commented above, all households experience lower declines in labor income. However, households with the largest shares of labor income coming from urban unskilled labor, get the highest improvements. This happens to households in deciles four to eight. Lastly, transfer income also falls less under this scenario and all households get about the same level of improvement.

As done before, it is useful to have an idea of the impacts on households' real income. Table 18 shows percentage changes in nominal income as deflated by the general consumer price index and by the own-decile price index. From there, it can be appreciated that real income falls in all cases, except for deciles one and five when real income is calculated on the basis of own-decile price indexes. In these cases there is practically no effect on household income.

As compared with the results from the impact of the crisis scenario, real income, as deflated by the general price index, lowers less for deciles two to nine, while lowers more for deciles one and ten. The differences between the two scenarios range from 0.1% to 0.7%. On the other hand, when real income is calculated according to own-decile price indexes, all households get improvements and these range between 1% and 1.9%. The highest improvements belong to households in deciles three to eight.

Therefore, government intervention effectively ameliorates the negative impact of the crisis on households' real income, benefiting the most those towards the middle of the income distribution.

Table 18.   Percentage changes in households' real total income. Scenario policy response.

Decile	Deflated by general price index	Deflated by own decile price index
1	-3.1	0.0
2	-2.6	-0.2
3	-2.4	-0.4
4	-2.0	-0.1
5	-1.8	0.0
6	-1.8	-0.1
7	-1.6	-0.2
8	-1.4	-0.1
9	-1.3	-0.2
10	-1.3	-0.4

Source: model simulation

Firms income decrease under this scenario, but slightly lower than under the former. Total firms' income fall 16.4% (1.4% less than before), while its components, capital and transfer income fall 17.4% and 15%, respectively. These results are less negative than before by 2.1% and 0.4%.

Government income falls too and does it 1.2% less than under the previous scenario. All components of government income fall less than before. The ones that change the least with respect to the impact of the crisis scenario are taxes on products and import taxes. Table 19 shows the relevant figures.

Table 19.   Percentage changes in government's income. Scenario impact of the crisis.

Item	Change (%)
Total income	-16.9
Capital income	-17.4
Income taxes (households)	-14.8
Income taxes (firms)	-17.4
Taxes on production	-18.8
Taxes on products	-20.1
Import taxes	-18.6
Transfers	-14.9

Source: model simulation

Lastly, GDP at basic prices falls 15.8%, 1.5% less than before, while the GDP deflator decreases 15.7%, yielding to a negligible decrease in real GDP. Hence, in spite of policy intervention leading to some improvements for ameliorating the negative impacts of the crisis, especially in terms of households' real income, its outcome is nil in terms of real GDP.

7. Comments on the Results and Conclusions

This research attempts to appraise the effects of the international economic crisis and the ensuing policy response by the government on the Colombian economy. While the transmission mechanisms of the crisis are complex and several of them are not readily amenable of appraisal through the analytical setting used here, some of the most important can usefully be modeled and their effects simulated by means of a computable general equilibrium model (CGE). The same is true regarding the set of policy responses implemented by the government.

We use a slightly modified version of the PEP-1-1 CGE model to simulate the effect of the drop in remittances and trade changes (prices and quantity changes) that the crisis brought upon the Colombian economy. Similarly, the effects of policy response, in the form of higher indebtedness and reprioritization of governmental expenses, are assessed.

Results indicate that lower remittances and trade changes do indeed have a negative impact on the economy, leading to negligible negative growth (after an important period of positive and sustained growth of the economy). On the export side, trade behavior largely depends upon international price movements. Most sectors experience shrinkages in export value and a few of them reap benefits. On the import side, all sectors shrink in terms of prices and quantities and, therefore, of value. Production destined to the domestic market also falls and so do prices.

Wages decrease for all labor types, affecting the most unskilled labor in rural and urban areas (especially the former). Decreases in labor demand follow for most sectors, layoffs being compensated by increases in labor demand from the sectors that expand production (due to exports behavior).

As a result, nominal income decreases for all household types and so does real income. However, decreases in real income tend to be lower the higher the income level of the household, in a regressive fashion.

On the other side, policy intervention plays a positive role. First of all, it smoothes price response before the crisis and gives more flexibility to the current account. Second, while reducing the shrinkage in the infrastructure sector, it allows for a relatively important improvement in wages for urban unskilled workers. Third, it improves real income for all households, although those in the middle of the income distribution benefit the most. However, its outcome in terms of GDP behavior is nil, calling into question the whole purpose of governmental intervention.

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ANNEX

"Sensitivity Analysis" for Changes in Remittances

As mentioned in the text, given lack of data about the behavior of remittances destined to particular household deciles, it was assumed in the simulations that all household types were affected in the same degree by the drop in remittances. Therefore, a uniform decrease of 14.4% was used across households. Since this is quite an ad hoc assumption, it is useful to see how it affects the results obtained at the household level vis a vis different assumptions that could have been made on the way remittances changed.

Two different ways of distributing the changes in remittances according to household type were used for this purpose. First a regressive one, in which it is assumed that low income households were relatively more affected than high income households by the decline in remittances. Second, a progressive one in which the opposite assumption is made. The effects of both were estimated for the impact of the crisis scenario. While other, perhaps more radically distributed, scenarios could have been used, the ones selected serve well the end of appraising the difference that it makes assuming a uniform distribution of the shock. Table A1, below, shows the percentage changes that were assumed in each case.

Table A.1   Alternative assumed percentage changes in remittances.

Decile	Uniform	Regressive	Progressive
1	-14.4	-100.0	0.0
2	-14.4	-88.0	-0.7
3	-14.4	-76.0	-2.8
4	-14.4	-64.0	-4.9
5	-14.4	-52.0	-7.0
6	-14.4	-40.0	-9.1
7	-14.4	-28.0	-11.2
8	-14.4	-16.0	-13.3
9	-14.4	-4.0	-15.4
10	-14.4	-1.9	-17.5

Table A.2 reproduces Table 11 in the text, showing the percentage changes in households' nominal income arising from the impact of the crisis scenario with a uniform distribution of changes in remittances. Tables A.3 and A.4 show the difference between this scenario and the other two (regressive and progressive distribution of the shock). Figures in these tables should be interpreted as follows. A positive number means that the regressive or progressive scenario leads to a smaller effect than the one used in the main text, while a negative number means the opposite. The figures represent the difference in percentage terms. For instance the -0.9 shown under total income for decile one under the regressive scenario, means that the latter yields a decrease in total income that is 0.9% larger, while the 0.2 in the same position under the progressive scenario means that the decrease in total income is smaller in 0.2%.

Table A.2   Percentage changes in households' nominal income. Scenario impact of the crisis.

Decile	Total income	Capital income	Labor income	Transfer income
1	-17.5	-18.9	-17.7	-15.9
2	-17.4	-18.9	-17.7	-15.8
3	-17.4	-18.9	-17.6	-16.1
4	-17.2	-18.9	-17.5	-15.7
5	-17.1	-18.9	-17.4	-15.8
6	-17.0	-18.9	-17.3	-16.0
7	-16.8	-18.9	-17.0	-16.1
8	-16.4	-18.9	-16.7	-15.6
9	-16.1	-18.9	-16.0	-15.9
10	-15.7	-18.9	-15.0	-16.2

Source: model simulation

Table A.3   Difference in percentage changes in households' nominal income under the regressive scenario.

Decile	Total income	Capital income	Labor income	Transfer income
1	-0.9	0.0	-0.1	-6.1
2	-0.9	0.0	-0.1	-6.6
3	-0.8	0.0	-0.1	-5.1
4	-1.0	0.0	-0.1	-4.7
5	-1.3	0.0	0.0	-6.1
6	-1.0	0.0	0.0	-4.3
7	-0.4	0.0	0.0	-1.6
8	-0.1	0.0	0.0	-0.2
9	0.4	0.0	0.0	1.2
10	0.5	0.0	0.0	1.5

Source: model simulation

Table A.4   Difference in percentage changes in households' nominal income under the progressive scenario.

Decile	Total income	Capital income	Labor income	Transfer income
1	0.2	0.0	0.0	1.0
2	0.2	0.0	0.0	1.2
3	0.2	0.0	0.0	1.0
4	0.2	0.0	0.0	0.9
5	0.2	0.0	0.0	1.2
6	0.2	0.0	0.0	0.9
7	0.1	0.0	0.0	0.4
8	0.0	0.0	0.0	0.1
9	0.0	0.0	0.0	-0.1
10	-0.1	0.0	0.0	-0.4

Source: model simulation

From the tables it can be appreciated that the differences in total income changes are relatively small. Under the regressive scenario they are larger but never go beyond 1.3% (in absolute terms). In the case of the progressive scenario, the differences are small, 0.1% being the largest. Results for capital income show no changes between alternative assumptions and for labor income there are small changes for deciles one to four under the regressive scenario. As expected, differences in transfer income tend to be of significance in spite of remittances being only a part of total transfers.

Differences in percentage changes for transfer income follow the direction of the assumptions made (either regressive or progressive in nature) and are larger (in absolute value) under the regressive scenario as a consequence of having smaller figures as a starting point. Nonetheless, they lead to the larger differences in total income changes already mentioned above.

In sum, use of other assumptions about the way changes in remittances may be distributed among household types, seems to yield moderate differences in income changes and, more importantly, does not introduce modifications in the nature of the results presented.