

# Lessons from the past crisis: policy responses to external shocks in Uruguay<sup>1</sup>

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## Abstract

The 2008 global crisis affected the Uruguayan economy through two main channels: collapse in global trade and drop in capital flows. As a reaction to the crisis, the Uruguayan government adopted a countercyclical policy, increasing public consumption and investment and expanding social benefits to unemployed workers. In this paper, we apply a static computable general equilibrium model (CGE) linked to a microsimulation model to analyze how effective were the policy responses to prevent or soften the impact of the global crisis on the Uruguayan economy. We find the crisis had a negative impact on exports and fixed investment, result that is consistent with what actually happened in the Uruguayan economy during the first year after the beginning of the crisis. Poorest households were the most affected, as they faced a stronger reduction in real wages and a rise in unemployment. Of the three policies implemented by the government in the aftermath of the crisis, only an increase in public investment is effective in mitigating the negative impact of the crisis on extreme poverty. In spite of this, this policy has still some negative effects on the economy, as public investment crowds out private investment, which in the long run might have a negative impact on growth. The other two policies reinforce the negative effect on income and extreme poverty through a fall in total investment in the economy. The three policies are very costly and they have an important impact on macroeconomic variables and structure of production and export, while they have slight or negative results on poverty and households' income. More focalized policies, such as direct cash transfers to households, might have better results in terms of cost-benefit.

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## 1. Introduction

The financial crisis that burst in September 2008 soon spread throughout the world and became a major global economic crisis. World real GDP fell 2.3% in 2009, and global exports experienced the deepest fall since the Great Depression of 1930s (Baldwin, 2009). The epicenter of the crisis was in the developed economies' financial systems, mainly United States and Europe, but their financial and economic links with the rest of the world soon took the crisis to developing countries. The main channels of transmission of the crisis to the developing countries have been discussed extensively: i) collapse in global trade and fall in international prices; ii) drop in capital flows, affecting FDI and equity investment; iii) fall in remittances; and iv) fall in aid flows (Willem te Verde, 2008; World Bank, 2009). In the case of Uruguay, the two first channels seemed to have played a more important role.

The first channel, collapse in global trade, is particularly important for Uruguay, a small open economy with relatively low protection levels and integrated to MERCOSUR, a regional trade bloc conformed by Argentina, Brazil, Paraguay and Uruguay.<sup>2</sup> The country has strong comparative advantages in agriculture and food products and is highly dependent on imports of intermediate inputs and oil. Meat, cereals (rice and wheat), dairy products, wood, vegetable oils, barley, leather, fish and wool concentrated almost 63% of total value of exports of goods in 2007 (see Table A 2). Demand for food products is usually less elastic to changes in income than demand for manufactures or durable goods, and as Freund (2008) has estimated, exports of food and beverages have been less impacted in context of past global crisis. Given the high concentration of Uruguayan exports on food products, we might expect a lower impact on the reduction of world demand on Uruguayan export volumes as a consequence of the crisis. However, there are two indirect associated effects that could result in larger real impacts. First, the impacts of the crisis in the MERCOSUR region, particularly Brazil, the main destination of Uruguayan exports. Uruguayan manufacture exports are highly concentrated to the region, so the effects of the crisis could indirectly impact the manufacturing sector as long as the main MERCOSUR partners are more severely hit. Second, the crisis might also have an affect on global trade policy decisions in the developed economies, which subsequent increase in protectionist levels that might also amplify the effect of the crisis.

The second channel of transmission is also potentially important for Uruguay as FDI flows constitute the main component of capital account. The financial crisis led to a major credit crunch and a loss of confidence in financial systems. As a consequence, lending costs increased and credit availability to riskier counterparts fell. Most emerging economies suffered a fall in short-term debt in the first quarter of 2009 (see data from Joint External Debt Hub, World Bank). In the case of Uruguay, the credit crunch is reflected in the fall of portfolio investment, which is usually the most volatile category of the capital account of the balance of payments (see Table A 3 in Annex). Table A 3 also shows how foreign direct investment (FDI) flows were affected during the crisis. FDI had shown an impressive growth between 2005 and 2008, increasing from 2.4% of GDP in 2004 and increased up to 5.7% of GDP in 2008. After the crisis, FDI stagnated, and in 2009 the FDI/GDP declined up to 3.8%, which represented a fall of 5.5

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<sup>2</sup> Trade openness indicator, measured as the ratio of exports plus imports to GDP, was 57.9% in 2007. That same year, average tariff applied by the country to imports from outside MERCOSUR was 9.2%. See Table A 1 in Annex for this and other trade indicators.

billion dollars with respect to 2008.<sup>3</sup> As a reaction to their balance of payments contraction, several countries depreciated their currencies. Depreciation was also a consequence of depressed international prices. Real exchange rate in Uruguay also depreciated in the first half of 2009, but it recovered again during the second half and by the end of 2009, there was real exchange rate appreciation compared to 2008.

As a consequence of the crisis, and after six years of steady GDP growth rate following 2002 recession, during the first quarter of 2009 real GDP showed the first decrease (-2.9%). Although GDP immediately recovered during the second quarter of 2009, there was a substantial slowdown of GDP growth rate in 2009. As a consequence of the reversal of the economic cycle, in the first months of 2009 government revenues showed a shortfall and the fiscal deficit significantly expanded. While government projections before the beginning of the crisis situated the fiscal deficit in -0.4% of GDP for 2009, the fiscal deficit finally reached -1.7% of GDP in 2010. Besides, the declining growth has potential negative implications for income, employment, investment and, in the last instance, for poverty. The negative impact on poverty is reached through two mechanisms: on one hand, through a fall in labor demand, implying an increase in unemployment and a fall in wages; and on the other hand, through a fall in government revenue, which in turn could have a negative effect on public transfers to poor households.

Despite the deterioration of fiscal performance, the financial situation of the public sector did not appear as a significant source of vulnerability, and the government allowed an increase in public deficit rather than cutting government spending (which would have implied a pro cyclical response). Public consumption and investment increased 9.4% and 29.5% in real terms in the first half of 2009, implying a clear countercyclical movement. In addition, some “automatic devices” turned on in the downward economic cycle, such as unemployment insurance. Although most up to 2005 studies indicate a relatively low coverage of unemployment insurance in Uruguay, formal employment has increased considerably during the last four years, mainly due to the re installation of collective wage bargaining. So, reasonably, unemployment insurance coverage is expected to act as a compensatory policy for a larger proportion of workers than it did in past years. Furthermore, as a compensatory policy to the crisis, the government temporarily extended the period of coverage of the unemployment insurance and modified benefit rates<sup>4</sup>. The observed facts for Uruguay indicate a rise in unemployment insurance requests and in unemployment insurance coverage during the crisis climax (September, 2008 – March, 2009).

This paper aims to analyze the impact of the global financial and economic crisis on the Uruguayan economy, and to discuss to what extent the policy responses of the Uruguayan government were effective in counteracting the negative effects of the crisis. This exercise is particularly important for Uruguay, a small open economy that has been exposed to several

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<sup>3</sup> The other two channels of transmission of the crisis, remittances and aid flows, are not significant in the case of Uruguay. Neither of both flows has represented more than 1% of GDP along the last decade. Besides, aid flows actually increased during 2009, both in absolute terms and relative to GDP; and even though remittances fell in 2009, the decline was slight.

<sup>4</sup> Benefits were increased the first months of the unemployment period and then gradually decreased (BPS, 2010).

external shocks in the last 20 years, and might be affected in the next future in case a new crisis develops. Thus, it is important to understand which are the main sources of vulnerability of the economy, and to identify whether public interventions help to minimize these vulnerabilities. Even though the Uruguayan economy presents distinctive features, the overall conclusions of this study might also be of use to other countries highly exposed to external shocks. In order to analyze the impact of the recent economic and financial crisis on the Uruguayan economy, we apply a Computable General Equilibrium (CGE) model and microsimulations. Even though the methodological tool is more appropriate to make ex ante evaluations, an ex post evaluation is interesting in this case because it allows to disentangle the different channels through which the crisis affected the Uruguayan economy and to evaluate how policy responses to the crisis operated and to what point they were successful.

In the next section we present the methodology applied in this paper. Then, we analyze the results obtained, and finally we draw some conclusions.

## **2. Model and dataset**

In this section we first present the overall features of the CGE model applied in this paper. Then, we describe the main assumptions adopted in this study regarding the model, and we describe the non-parametric microsimulation methodology applied. Finally, we present the simulation scenarios designed for the purpose of this study.

### *2.1. PEP Standard model*

We apply the PEP standard model (PEP 1-1)<sup>5</sup>. It is a single country static model in which firms are assumed to operate in a perfectly competitive environment. Output in each firm is reached through a nested structure of production that combines value added and total intermediate consumption in fixed shares at the upper level (through a Leontief function) and nested CES functions at the lower levels, which combine factors of production on one side and inputs from different origins on the other side. Value added is obtained through two nested CES functions. At the upper level, capital and composite labor are combined, and the lower level composite labor is obtained combining labor of different skill levels: unskilled, medium-skilled and skilled labor. Capital includes land in this model.

There are four types of agents: households, firms, government and rest of the world. Households receive income from three sources: labor income, capital income, and transfers received from other agents. Disposable income left after taxes, savings and transfers to other agents is entirely dedicated to consumption. Consumption demand is determined through the maximization of LES-CES utility functions, and savings are a linear function of disposable income.

Government receives fiscal revenue through different types of taxes, and also receives part of the remuneration of capital and transfers from other agents, such as social security

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<sup>5</sup> The description of the model follows Decaluwé et al (2009), where a more complete presentation of the model, including its equations and assumptions, can be found. The model is free and of public access and can be retrieved from <http://www.pep-net.org/programs/mpia/pep-standard-cge-models/pep-1-1-single-country-static-version/>.

contributions from households. The rest of the world receives payments for the value of imports, part of capital income, and transfers from domestic agents. Foreign spending in the domestic economy consists of the value of exports, and transfers to domestic agents. The difference between foreign receipts and spending is the amount of rest-of-the-world savings, which are equal in absolute value to the current account balance, with opposite sign.

The demand for goods and services, whether domestically produced or imported, consists of household consumption demand, investment demand, demand by public administration, and demand as transport or trade margins.

In defining trade relations with the rest of the world, the model assumes the small country hypothesis: the world price of traded goods (imports and exports) is exogenous. However, the local producer is only able to increase his/her share of the world market by offering a lower price relative to the (exogenous) world price, depending on the price-elasticity of export demand. Producers' supply behavior is represented by nested CET functions: on the upper level, aggregate output is allocated to individual products; on the lower level, the supply of each product is distributed between the domestic market and exports.

Buyer behavior is symmetrical to producer behavior, in that it is assumed that local products are imperfect substitutes for imports (Armington assumption). Thus, commodities demanded on the domestic market are composite goods, combinations of locally produced goods and imports. The imperfect substitutability between the two is represented by a constant elasticity of substitution (CES) aggregator function. According to the small-country hypothesis, the price-elasticity of import supply is assumed to be infinite at the existing world price.

Supply and demand equilibrium is verified in goods and services market and in the factor market. Also, total investment expenditure is equal to the sum of agents' savings. The sum of supplies of every commodity by local producers is equal to domestic demand for that commodity produced locally. Finally, supply to the export market of each good is equal to demand.

A savings driven closure is adopted. Real investment is endogenous and follows available savings. The trade balance is exogenous and the real exchange rate is the equilibrating variable. We assume capital is sector specific and labor is mobile across agriculture sectors on one side, and non-agriculture sectors on the other. We take the Consumer Price Index as the numeraire in the model.

## 2.2. Modifications to PEP Standard model

Some modifications were introduced in order to adapt the model to the Uruguayan case and to the objectives of this paper. First, we introduced unemployment in the labor market, through a wage curve that negatively relates unemployment and wages (Blanchflower and Oswald, 1995), as specified in Equation 1, with  $\frac{W_l}{PIXCON}$  being the real wage of type I labor,  $U_l$  the unemployment level of type I labor,  $A_{wc}$  a scale parameter and  $\sigma_{wc}$  the elasticity of wages to unemployment level.

$$\frac{W_l}{PIXCON} = A_{wc} * U_l^{\sigma_{wc}} \quad (1)$$

This specification for labor market has been widely applied in CGE models (Carneiro and Arbache, 2003; Terra et al, 2010, among others) and is consistent with the efficiency wage theory, which argues that in certain economies firms have an incentive to pay salaries above the average in order to promote higher efficiency or lower quit rate among workers. In a context of high unemployment, firms do not need to pay a high incentive, since workers are more prone to lose their jobs. Thus, the higher the unemployment rate in the economy, the lower the wage premiums and the average wage rate of the economy. The wage curve has been estimated empirically in several countries, including Uruguay. In this study, we take the estimated elasticities of wages to unemployment from Bucheli and Gonzalez (2007), who found a significant wage curve relation for unskilled and semiskilled workers, with estimated elasticity of -0,145 and -0,139 respectively.<sup>6</sup>

Second, we did not consider firms as separate agents of the model. We made this simplification because we are not considering any change in fiscal policies affecting firms' income (as changes in direct taxes on firms for example). Instead, we are only considering households, government and the rest of the world as relevant type of agents for this analysis.

Third, we separated public and private investment, in the spirit of the dynamic version of the PEP Standard Model (PEP-1-t; see Decaluwé et al, 2010). This modification was necessary in order to evaluate the public policies implemented by the government, as an increase in public investment. With this modification, we now have three new equations in the model:

$$PC_i INV_i^{PRI} = \gamma_i^{INVPRI} IT^{PRI} \quad (2)$$

$$PC_i INV_i^{PUB} = \gamma_i^{INVPUB} IT^{PUB} \quad (3)$$

$$INV_i = INV^{PRI} + INV^{PUB} \quad (4)$$

Where  $INV_i^{PRI}$  and  $INV_i^{PUB}$  are the final demand of commodity  $i$  for private and public investment purposes respectively. Total demand of commodity  $i$  for investment is the sum of private investment and public investment (Equation 4). Both private and public investment ( $IT^{PRI}$  and  $IT^{PUB}$ ) are distributed among commodities in fixed shares (Equations 2 and 3); implicitly, the production function of new capital is Cobb-Douglas. So, for a given amount of investment expenditures, the quantity demanded of each commodity  $i$  for investment purposes (public or private) is inversely related to its price. Public investment is assumed fixed in real terms.

Regarding government balance, we assume real government consumption and tax rates are fixed, so savings equilibrate government accounts. This implies a change to the PEP model, as we assumed government consumption of each commodity in real terms as fixed, instead of taking total government spending as fixed.

Finally, in order to evaluate the public responses to the crisis, we also introduced a fourth modification, introducing a new component of public transfers, unemployment insurance transfers, linked to the level of unemployment of the economy, as presented in Equation 5. Unemployment benefits paid by the government to each household type ( $B_h$ ) increase

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<sup>6</sup> The authors did not find a significant effect of unemployment on wages for skilled workers.

automatically when unemployment increases ( $U_l$ ), and also if the government decides to manipulate the level of benefits through parameter  $\alpha_{B_h}$ , which represents the initial value of benefits per household type.

$$B_h = \alpha_{B_h} * \sum_l U_l \quad (5)$$

### 2.3. *Microsimulations*

In order to analyze the effect of some of the scenarios on poverty and income distribution, we complemented the CGE analysis with microsimulations. We apply a non-parametric microsimulation approach, as proposed and discussed in Vos et al (2006) and Sanchez and Vos (2010). It is a top-down approach that takes the results of the CGE model on unemployment rates, employment, wage rates, returns to capital and consumer prices and feeds them into a microsimulation module with data from Continuous Household Survey for Uruguay for 2005. Once the income of households and poverty lines of the economy are updated, we estimate changes in poverty headcount, extreme poverty headcount and Gini index. This method is useful to be able to track the impact of shocks and policies to the micro level. One advantage of the non-parametric method applied in this paper is that there is no need to reconcile the data from the SAM with data from the household survey.

### 2.4. *Data and calibration*

For calibration purposes, we use a 2005 SAM for Uruguay based on the last recently published Tables of Supply and Use (Central Bank of Uruguay, 2005). Given that the economic and trade structure of Uruguay did not experience significant changes between 2005 and 2008, we did not re-balance the SAM.

The SAM has 55 activities, six types of labor according to formal education (unskilled/medium-skilled/skilled<sup>7</sup>) and sector of activity (agricultural/non-agricultural), and one type of capital. The ample sectoral disaggregation of the SAM allows us to introduce specific price and demand shocks in the main export oriented goods and service sectors. We adapt the 2005 SAM to the model requirements, mainly simplifying some accounts, such as taxes.

We calibrate public investment using National Accounts data, unemployment transfers with information from the National Institute of Social Security (BPS), and percentage of unemployed receiving the insurance from the National Household Survey (ECH-INE). All data is for year 2005.

Households are disaggregated into five groups in the SAM, according to quintiles of income. Even though other criteria is usually recommended for classification of households (see Decaluwe et al., 1999), this classification is relevant for Uruguay because it allows differentiating very distinctive patterns of income and consumption<sup>8</sup>. For example, households belonging to the poorest quintile receive their income mainly from transfers and unskilled

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<sup>7</sup> In this study we define unskilled labor for workers with 6 years of schooling or less; medium-skilled labor has between 7 and 11 years of schooling and skilled workers has 12 years of schooling or more.

<sup>8</sup> Some of the criteria usually suggested is not relevant for the Uruguayan case; for example, the differentiation between urban and rural households, because rural households are negligible in Uruguay

labor wages, while households in the highest quintile of income obtain their income from capital income and skilled labor wages. In any case, as we enrich the results from the CGE model with a microsimulation analysis, we are able to analyze the impact on income distribution and poverty at the micro level.

Values of elasticities are taken from literature and previous estimations for Uruguay. We take short-term values, allowing for very imperfect substitution, and we test the sensitivity of results to changes in these values. Values assumed in the base scenario are presented in Table 1. Regarding factor substitutability, we assume producers have a low flexibility to adjust to shocks by changing the composition of their labor force in the very short term. Therefore, we use low values of elasticities of substitution between different types of labor (0.7) and labor and capital (1.1). We take the lower bound of the average Armington elasticity estimated by Cassoni and Flores (2009) for Uruguay and for sensitivity analysis, we double the value. We assume the same value for CET elasticity of transformation between exports and local sales.

**Table 1. Parameter values assumed in the model**

Parameter		Value	Values for sensitivity analysis
Trade elasticities	Armington elasticity	0.9	1.8
	CET - Exports and total sales	0.9	1.8
CET	Total output	2	-
	Price elasticity international demand for exports	2	1
CES- Value added	Composite labor	0.8	1.6
	Labor-capital	1.1	-
	Frisch	-2	-
LES-CES parameters	Income elasticity food	0.7	-
	Income elasticity other	1.1	-
Wage curve elasticities	Unskilled labor	-0.145	-
	Semi-skilled labor	-0.139	-

Source: own elaboration

## 2.5. Scenarios

We simulate four different scenarios. The first one seeks to replicate the main transmission channels of the global crisis to the Uruguayan economy. Then, we simulate three scenarios of policy response, and finally we simulate all policy responses together. All policy response scenarios are run together with the crisis scenario.

The crisis scenario replicates the main shocks suffered by the Uruguayan economy during the global crisis. As presented above, the global crisis affected Uruguayan exports through two main channels: a fall in external demand and a fall in international prices. Of the main 13 export sectors in Uruguay, which account for more than 2.5% of total exports separately and 65% of total export at the benchmark, 9 sectors experienced a fall in the export value between the first half of 2008 and the first half of 2009 (see Table 2). In some of them the decline was very important –such as leather, wood, textiles, meat and refined oil. In such cases, exports in



volume did not experience an important change, so we assume a price shock. In the case of commodities, we took the price variation reported by the IMF; while in the case of industrial goods, we took the export price indices reported by the Uruguay Chamber of Industry (CIU). Dairy prices were taken from USDA. IMF reports prices at a disaggregated level and some of the sectors included in the SAM are composed by several different products. In these cases, in order to compute the price change for the whole sector, we estimated the weighted average price change of the different products that are included in each sector, using exports at the benchmark as weights.

In the case of most industrial non-food sectors and services, we assume a demand shock. As these sectors are mainly oriented to the MERCOSUR area, we assume that the size of the shock is equal to a weighted average of the GDP fall from our main trade partners, Argentina and Brazil, again using trade weights at the benchmark.

Together with the negative price or demand shock on export sectors, the country also received a positive external shock as the international prices of the main import commodities also fell as a consequence of the crisis. Therefore, we also simulate the fall in international prices of oil, Uruguayan main import product.

Regarding the external financing channel, we simulate the negative financial restriction from the rest of the world via a negative shock in the rest of the world's savings. We took the reduction of FDI (the most important and structural part of capital inflows) to estimate the magnitude of the shock. FDI declined 48% between June 2008 and June 2009 (Central Bank of Uruguay). We simulate this shock via an equivalent reduction of the current account balance.

**Table 2. Simulated shocks in manufacturing export sectors**

Description	Share in total exports at benchmark	Var exports, Jan-June 2008/Jan-June 2009 (in %)	Shock (percentage variation)	Type of shock
Meat processing	19.23	-28.53	-3.1	Price
Refined petroleum products and nuclear fuel	6.41	-46.18	-52.2	Price
Leather products	5.24	-41.77	-15.9	Price
Dairy products	5.23	-19.42	-51.9	Price
Sugar	4.99	44.32	-8.2	Price
Rice processing	4.24	35.75	-19.6	Price
Textiles	3.88	-34.72	-38.9	Price
Cereals and other primary	3.24	18.09	-29.3	Price
Fish products	2.91	3.34	-6.7	Price
Basic Chemicals	2.81	-26.86	-1.0	Quantity
Rubber and plastic	2.97	-12.86	-1.0	Quantity
Metal products and machinery	2.82	-18.36	-1.0	Quantity
Passenger transport	9.80	n/d	-1.0	Quantity

Source: IMF, Chamber of Industries of Uruguay

Then, we simulate three different scenarios of policy response to the crisis. As already presented, the Uruguayan government increased consumption and investment during the period of the crisis, allowing for a higher fiscal deficit. We simulate an increase in the two components of public expenditures, taking the real increase between June 2008- June 2009. Public consumption increased 9.4% and public investment 29.5%. We simulate the increase in these two components, first separately and then together. Since the adopted fiscal measures did not imply an increase in taxes, we simulate these scenarios contemplating an increase in public spending and allowing a broader fiscal deficit.

In addition, some “automatic devices” are turned on in downward economic cycles, as unemployment insurance. The observed facts for Uruguay indicate a rise in unemployment insurance requests and in unemployment insurance coverage during the crisis climax (September, 2008 – March, 2009). Thus, as a third countercyclical policy, we simulate a 15% increase in the unemployment benefits paid, which was the actual increase in the first half of 2009 (BPS, 2010).

A last scenario that simulates the three policy scenarios together with the crisis scenario seeks to replicate the main economic facts during the economic crisis. The scenarios are summarized in the following table.

**Table 3. Simulation scenarios**

<i>Name</i>	<i>Brief description of scenario</i>	<i>Variable/parameter shocked</i>
<b><i>Crisis shock</i></b>		
1. Crisis	Export price fall in primary activities and food, textiles and leather manufacturing	PWX
	Import price fall in petroleum	PWM
	Fall in external demand of basic chemicals, rubber and plastic, metal products and transport	EXD
	Fall in current account balance (external finance restriction)	CAB
<b><i>Policy response shocks</i></b>		
2. Government consumption (PUBCON)	Crisis + 9.4% increase in real public consumption of commodities	CG
3. Public investment (PUBINV)	Crisis + 29.5% increase in real public investment	ITPUB
4. Unemployment benefits (UNBEN)	Crisis + 15% increase in unemployment benefit coverage rate	$\alpha_{B\Box}$
5. Complete policy response (PUBTOT)	Crisis + Pubsp + Pubinv + Unben	

Source: own elaboration

### **3. Results**

We first present and analyze results of the crisis, and then we focus on the effect of policy responses from the Uruguayan government. We should keep in mind that our model will not predict the actual impact of the crisis, but is useful in order to shed light to some of the mechanisms behind it and its distributional effects.

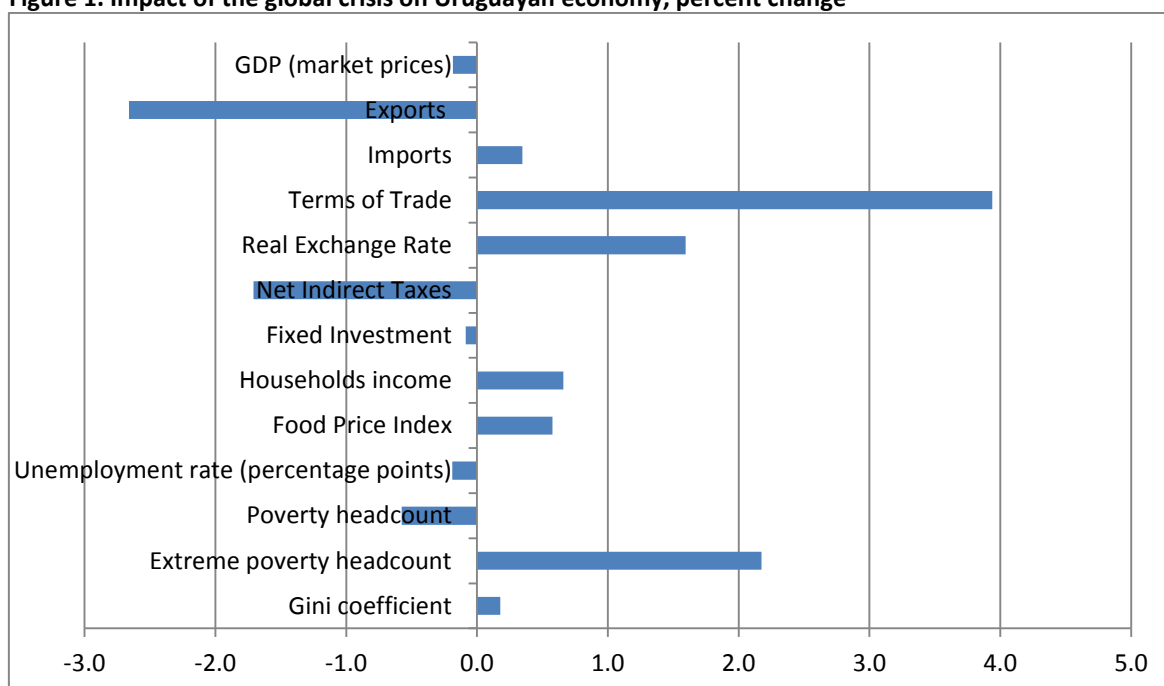
### 3.1. The impact of the 2008 financial crisis on Uruguayan economy

Our model predicts a negative impact of the global crisis on the Uruguayan economy, as presented in Figure 1. The results are close to the actual short-term impact of the crisis, when GDP, exports and investment were negatively affected. The main transmission mechanism of the global crisis to the economy is the trade channel, especially through the fall in commodity prices of the main export products of the country. As prices go down, exports in value fall 6.1%, while the effect on volume is less pronounced: -2.7%. The fall in exports leads to a decrease in production and factor demand of main export sectors in agriculture and light manufactures sectors. The most hardly hit sectors are dairy, cereals, textiles and leather. On the other hand, some sector benefit from a fall in oil products and their production is boosted. This is the case of some industry sectors, such as chemicals, and services, such as transport services.

The fall in exports of main exporting products leads to a real exchange rate depreciation, which is reinforced by the increase of oil imports due to a depressed international price. The increase in the real exchange rate improves competitiveness of other exporting sectors, mainly industrial and services. Terms of trade improve for the country, as import prices (mainly oil) and imports of the rest of products fall more than exports. Thus, even though the crisis has a clear negative impact on traditional agriculture exporting sectors, other sectors of the economy benefit from the fall in oil prices and the real exchange rate appreciation.

The fall of production in export sectors leads to a decrease in government indirect tax revenues. Therefore, as we assume constant public consumption expenditures, government income and savings fall, driving to a fall in total investment of the economy, as we are adopting a savings driven closure in the model. However, the main mechanism behind the fall in investment is the foreign savings restriction faced by the country.

**Figure 1. Impact of the global crisis on Uruguayan economy, percent change**



Source: CGE results

In the labor market, unskilled workers are negatively affected, especially those employed in agriculture sectors. Their real wages fall and unemployment increases. Medium-skilled and skilled workers are slightly benefited due to the expansion of some industrial and service sectors, and that explains the fall in unemployment rate among semi-skilled workers and the fall in poverty rate. However, unskilled workers constitute the most vulnerable segment of population. As Figure 1 shows, extreme poverty increases as a consequence of the crisis, and income distribution worsens. Given this context, a policy response by the government in order to mitigate the most negative effects on the vulnerable population would be desirable. In the next section we analyze how effective was the actual response of the Uruguayan government to prevent the negative impact on poverty.

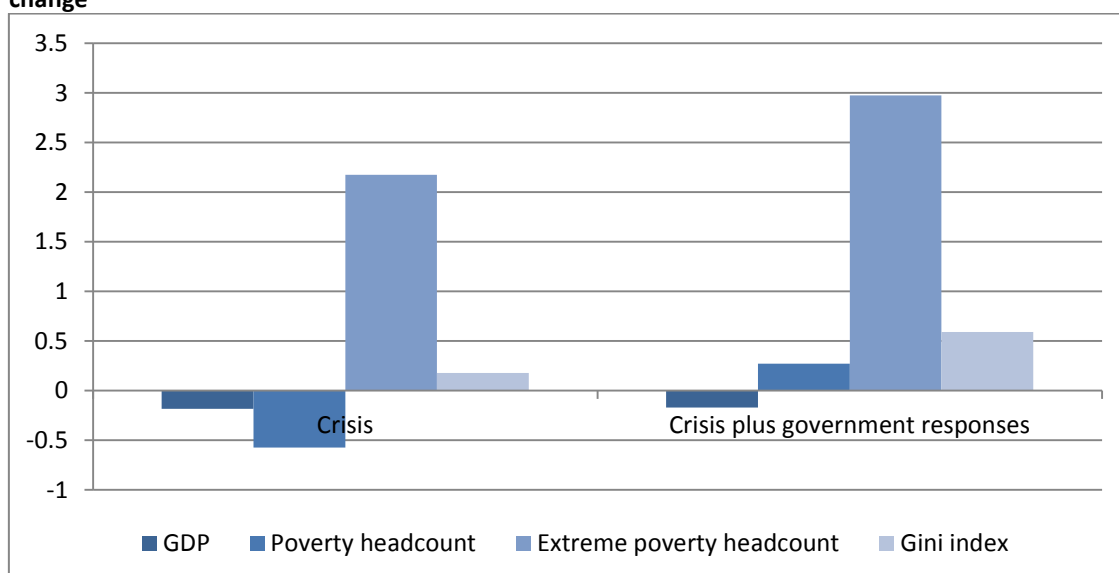
### 3.2. Policy responses

#### 3.2.1. Overall effect

In this section we discuss the alternative policy instruments applied by the Uruguayan government during the crisis. Figure 2 compares the effect on GDP and poverty indicators of the crisis without and with policy responses. The government response has a positive but slight effect on GDP, which falls slightly less. On the contrary, the policies implemented have a negative effect on poverty and income distribution.

With the policy intervention, the demand composition of the economy varies significantly. Public consumption increases and overall investment falls. The policy response also leads to an additional decrease in trade flows (exports and imports) and a lower real depreciation, compared to the crisis scenario. This is the overall effect of three distinctive policy responses. We analyze in higher detail the differentiated impact of each on these policies next.

**Figure 2. Impact of crisis and policy response on GDP, poverty and income distribution. Percent change**



Source: CGE and microsimulation results

### 3.2.2. Impact on macroeconomic variables and the labor market

We focus on the effects of each of the three policies separately in order to understand how effective each of them is in counterbalancing the negative effects of the crisis. Tables 4 to 6 compare effects of these policies on macroeconomic variables, production by sectors and the labor market respectively. All results are shown as percentage change with respect to the benchmark. We should take into account that all policy effects also include the effects of the crisis.

**Table 4. Impact of policy response on macroeconomic variables, percent change**

	CRISIS	PUBCON	PUBINV	UNBEN	PUBTOT
<b>National Accounts</b>					
Private Consumption	0.89	0.86	0.94	0.83	0.92
Fixed Investment	-0.09	-5.55	-0.26	-0.46	-6.03
Government Consumption	0.00	9.40	0.00	0.00	9.40
Government Savings	-1.09	-16.81	-0.98	-1.67	-17.49
Exports	-2.66	-3.60	-2.84	-2.69	-3.80
Imports	0.35	-0.23	0.09	0.03	-0.59
GDP (market prices)	-0.18	-0.19	-0.16	-0.22	-0.17
Net Indirect Taxes	-1.71	-2.24	-1.72	-1.81	-2.28
GDP (factor cost)	0.05	0.13	0.08	0.03	0.15
<b>Prices</b>					
Food Price Index	0.58	0.34	0.58	0.62	0.34
Real Exchange Rate	1.59	1.30	1.65	1.76	1.40
Terms of Trade	3.94	0.40	-0.48	-0.21	0.53

Source: CGE results

**Table 5. Impact of policy response on sectoral production, percent change**

	CRISIS	PUBCON	PUBINV	UNBEN	All policies
Primary	-1.80	-2.03	-1.92	-1.79	-2.15
Agro-food	-2.04	-2.13	-1.97	-1.97	-2.02
Manufactures	0.97	0.04	0.85	0.78	-0.16
Services	0.53	0.50	0.68	0.50	0.64

Source: CGE results

**Table 6. Impact of policy response on labor market, percent change**

	CRISIS	PUBCON	PUBINV	UNBEN	All policies
<b>Wage rate (percentage change)</b>					
Skilled labor, agriculture	1.73	0.30	1.36	2.01	-0.01
Semi-skilled labor, agriculture	-0.29	-0.72	-0.37	-0.19	-0.78
Unskilled labor, agriculture	-4.30	-4.73	-4.38	-4.21	-4.78
Skilled labor, non agriculture	1.62	4.45	1.47	1.47	4.24
Semi -skilled labor, non agriculture	0.55	0.65	0.57	0.48	0.63
Unskilled labor, non agriculture	0.61	0.16	0.88	0.54	0.38
<b>Capital returns</b>	0.91	0.33	0.89	0.80	0.28
<b>Unemployment rate (percentage points)</b>					
Semi-skilled labor, agriculture	0.20	0.52	0.26	0.13	0.56
Unskilled labor, agriculture	2.82	3.16	2.88	2.74	3.20
Semi -skilled labor, non agriculture	-0.42	-0.49	-0.43	-0.36	-0.47
Unskilled labor, non agriculture	-0.54	-0.14	-0.77	-0.48	-0.34

Source: CGE results

The increase of public expenditure by 9.4% in real terms (PUBCON) has a positive but very slight effect on GDP, which falls 0.01 percentage points less than under the crisis scenario. The increase in government consumption leads to a substantial decrease in government savings, from 6.9% to 5.8% of GDP, and in total investment (more than 5.5 percentage points than in the crisis scenario), due to the fall in public savings. The increase in demand from the public sector is mostly for non-tradable goods, leading to real exchange rate appreciation with respect to the crisis scenario, and a greater reduction of exports (3.6% in real terms). Under this scenario, the major sectoral changes with respect to the crisis scenario are a decline in production of the construction sector and in the manufactures of metal and mineral products, a greater reduction of production and imports of light manufactures such as textiles and footwear, and an increase in value added of public services, education and health. The first two facts are a consequence of the significant reduction of investment, derived from the reduction of government savings, and the loss of competitiveness of exports. On the other hand, the government consumption expansion derives in the significant increase in public services, education and health, as public consumption is concentrated in these activities. This has a strong positive impact on relative remunerations of workers. Skilled non-agriculture workers, employed in education and health sectors, are benefited by this policy, while unskilled workers are hurt as construction sector and traditional exporting sectors contract. As a consequence of the crisis, unemployment for unskilled workers in the agriculture sector increases; now, as a consequence of the government intervention, unemployment increases among all types of workers except semi-skilled non-agriculture workers.

The PUBINV scenario simulates a 29.5% increase in public investment. This policy has a lower impact on macroeconomic variables than the increase in public consumption, but contrary to this policy, the impact is mostly positive: GDP falls less and private consumption increases more. However, due to external finance restriction faced by the country, the increase in public investment cannot be financed with external savings, and it crowds out private investment. Thus, total fixed investment falls, but only slightly more than in the crisis scenario. Note that this result could change in a dynamic setting, if we introduced other options of financing public investment, like foreign borrowing. In that case, the crowd-out effect would not necessarily

take place in the short (or medium) run. We discuss this alternative scenario in the last section of this paper. Public investment is highly concentrated in the construction sector, which is intensive in the use of capital and unskilled labor. Thus, if we consider the sole effects of this policy, unskilled workers are benefited: wages rise and unemployment falls.

The UNBEN scenario simulates an increase in unemployment benefit rate paid by the government. This policy reduces government savings and consequently has a negative impact on investment, fact that counteracts the initial positive effect on household income derived from the increase in unemployment transfers. The overall macro effect of the UNBEN scenario is not significant either: GDP falls by 0.22%, very similarly to the crisis scenario with no policy response. However, this policy has a distinctive positive impact on the agriculture sector. Real exchange rate depreciates even more than in the crisis scenario, and export demand increases. Exporting sectors not affected initially by the crisis are better off than in the crisis scenario. This happens as a consequence of a fall in public expenditure, which, as we have already noted, is focused in non-tradable goods. Consequently, workers employed in the agriculture sector are benefitted with higher increases or lower declines of wages and unemployment with respect to the crisis scenario, while workers in the non-agriculture sector, mostly services, are harmed.

### 3.2.2. Impact on households' welfare and poverty indicators

Of the three policies implemented by the government, only the increase in public investment increases income for all households but richest households, and benefit is higher for poorer households. The rest of the policies reinforce the regressive impact of the crisis on households' income. However, we should keep in mind that we are not capturing some of the welfare benefits to households provoked by an increase in public expenditure. We might expect that poor households are the ones that benefit the most by an improvement of public services like education and health. However, the model does not consider the existence of a public good in the households' utility function.

**Table 7. Impact of policy response on income and poverty indicators**

	CRISIS	PUBCON	PUBINV	UNBEN	All policies
<b>Real Income</b>					
Poorest quintile	-0.15	-0.49	-0.04	-0.17	-0.34
Second quintile	0.38	0.16	0.49	0.33	0.29
Third quintile	0.63	0.53	0.71	0.57	0.64
Fourth quintile	0.76	0.78	0.81	0.70	0.86
Richest quintile	0.90	0.97	0.90	0.82	0.97
<b>Poverty indicators</b>					
Extreme poverty	2.17	4.00	1.14	2.22	2.97
Poverty	-0.58	0.43	-1.01	-0.36	0.27
Inequality	0.18	0.71	0.08	0.19	0.59

Source: CGE results

These results are reinforced by microsimulation results, as shown in Table 7. The increase in public consumption worsens poverty and income distribution, while the increase in public investment has the opposite effect. The only effective policy to mitigate the negative impact of the crisis on extreme poverty is an increase in public investment. In spite of this, this policy has

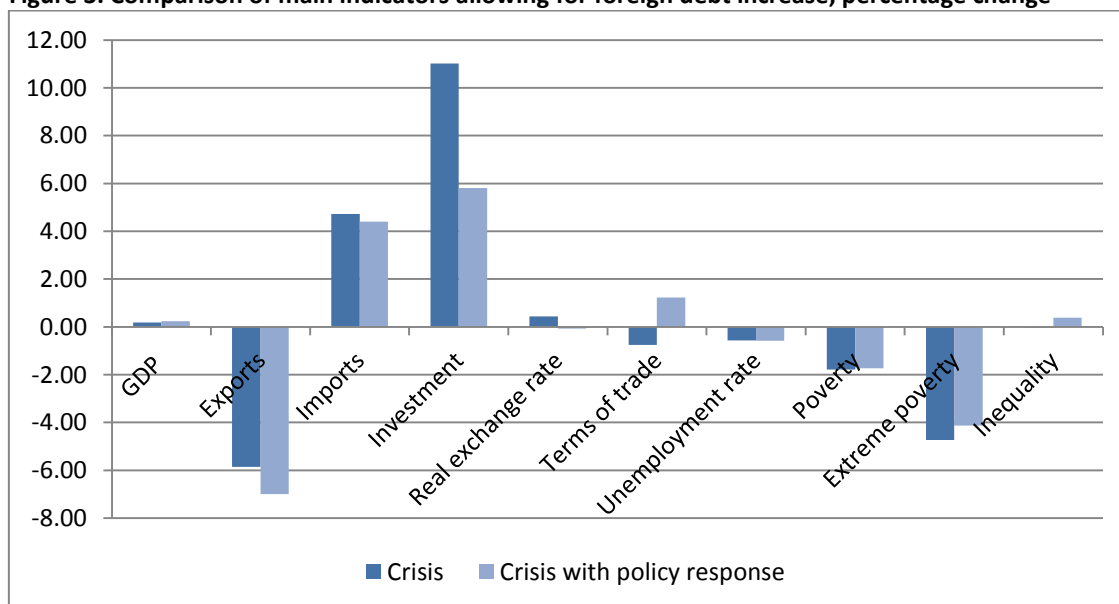
still some negative effects on the economy, as public investment crowds out private investment, which in the long run might have a negative impact on growth.

The three policies are very costly and they have an important impact on macroeconomic variables and structure of production and export, while they have slight or negative results on poverty and households' income. Thus, more focalized policies, such as direct cash transfers to households, might have better results in terms of cost-benefit.

### 3.4. Sensitivity of results to financing options

The previous policies are simulated assuming that the country faces foreign financial restriction, as part of the crisis shock. This assumption influences heavily results, as there are no options to finance the increased government consumption, investment or transfers. If we loosen this assumption, we can consider other financing options, such as by increasing external public debt, which that was actually exploited by the Uruguayan government. Indeed, the economy substantially lowered the ratio debt/GDP during the years prior to the global crisis. In this section we present the effects of the policy responses when we allow for an increase of the current account balance of 600%, which was its actual increase in 2008. We compare the results under this new assumption with results from simulating a crisis scenario (fall in export and import prices, fall in export demand) with the same increase in the current account balance (see Figure 3).

**Figure 3. Comparison of main indicators allowing for foreign debt increase, percentage change**



Note: Unemployment rate is expressed as change in percentage points

Source: CGE and microsimulation results

As Figure 3 shows, policy responses are not useful under this alternative closure. The crisis, as it does not have a financial restriction component, only affect trade flows but not real investment. As a consequence, unemployment and poverty fall even under the negative trade shock. In this context, government intervention only improves slightly GDP growth. Unemployment and poverty fall are less pronounced when there is a policy intervention.



### 3.4. Sensitivity of results to elasticity values

Table 8 shows how results change when we modify the values adopted for some key parameters of the model. Specifically, we test the sensitivity of results to changes in trade parameters (Armington elasticity, CET elasticity of transformation between domestic supply and exports, and price elasticity of international demand for exports), and in the elasticity of substitution between different labor categories in the firm's value added function.

Higher trade elasticity values imply that consumers –both final and intermediate- are more willing to substitute local and foreign goods. Thus, trade flows react more swiftly to the external shock –exports fall more but imports increase more, and real exchange rate depreciates more. This boosts production of other exporting sectors and non-tradable sectors, and thus wages increase more for non-agriculture workers. As average income increases more, so do private savings, and total investment increases. GDP does not fall, and poverty indicators perform better than under the base values of parameters. The main conclusions about the policy intervention remain under these new assumptions. In general, the increase in public consumption and investment has a negative effect on macroeconomic variables and worsens poverty indicators.

Results do not change significantly when we allow for a higher substitution of different categories of workers. The change in this assumption does not modify the main results on macroeconomic variables, but it does have a differentiated effect on the labor market. The main effect is on wages, as a higher substitution among workers with different qualifications makes demand shift from skilled workers to semi-skilled and unskilled workers, which experience a higher increase in wages. We see a higher fall in poverty and a lower increase in extreme poverty, compared to the base scenario. Under this new assumption, policy intervention has a positive effect on GDP, unemployment and poverty.

**Table 8. Comparison of main indicators**

	Base parameters		Change trade parameters		Change labor substitutability	
	Crisis	Crisis policy response	Crisis	Crisis policy response	Crisis	Crisis policy response
GDP	-0.2	-0.2	0.0	0.1	-0.2	-0.1
Exports	-2.7	-3.8	-3.4	-4.5	-2.6	-3.7
Imports	0.3	-0.6	1.0	0.2	0.4	-0.5
Investment	-0.1	-6.0	0.8	-5.1	0.0	-5.9
Real exchange rate	1.6	1.4	2.3	1.9	1.6	1.4
Terms of trade	3.9	3.9	5.1	5.5	3.6	3.8
Unemployment rate	-0.2	-0.1	-0.4	-0.4	-0.2	-0.3
Poverty	-0.6	0.3	-1.5	-0.7	-0.7	-0.4
Extreme poverty	2.2	3.0	-2.6	-1.0	1.1	1.2
Inequality	0.2	0.6	0.1	0.5	0.1	0.3

Source: CGE and microsimulation results

#### **4. Summary and concluding remarks**

The Uruguayan economy recovered promptly from the global crisis negative shock, and in 2010 real GDP increased 8.5%. However, our simulations suggest that the crisis had a short-term negative impact on the economy, and the most negatively affected population was the already poor. This fact highlights the importance of counting with specific policies aimed at counteracting the negative impact of external shocks on the most vulnerable population.

This paper uses a static computable general equilibrium model linked to a microsimulation model to analyze how the global crisis and different adopted policy responses affected the Uruguayan economy. The focus is on the trade and foreign flows channel, since they are the most important mechanisms through which the global crisis hit the Uruguayan economy. In this way, we mainly simulated the crisis through price reduction of key export and import sectors; a demand reduction coming from our main trade partners (Argentina and Brazil); and a foreign savings restriction via a cut in the current account balance. We also test how three distinctive policy responses by the Uruguayan government (increase public consumption by 9%, increase in public investment by 30%, and increase in coverage rate of unemployment benefits by 15%) were effective in counteracting the negative effects of the crisis.

We find the crisis had a negative impact on exports and fixed investment, result that is consistent with what actually happened in the Uruguayan economy during the first year after the beginning of the crisis. Reduction of exports derived from the simulated price and demand shocks and the foreign savings restriction would lead to a 0.2% reduction of GDP. Poorest households are the most affected, as they face a stronger reduction in real wages and a rise in unemployment. This is linked to the fact that output contraction is mainly focused on trade sectors, especially those related to primary and food manufactures, which are mostly unskilled labor intensive.

Of the three policies implemented by the government in the aftermath of the crisis, only an increase in public investment is effective in mitigating the negative impact of the crisis on extreme poverty. In spite of this, this policy has still some negative effects on the economy, as public investment crowds out private investment, which in the long run might have a negative impact on growth. An increase in public consumption benefits richer households, as public consumption is focalized in sectors that employ more intensively skilled labor. Thus, not only the policy does not tackle the problem of an increase in extreme poverty directly, but it also has an indirect negative effect and extreme poverty increases more, as total investment falls under this policy. Finally, an increase in unemployment benefits has an unexpected indirect positive effect on agriculture exporting sectors and benefit somehow unskilled workers, but it is not strong enough to reduce extreme poverty.

The three policies are very costly and they have an important impact on macroeconomic variables and structure of production and export, while they have slight or negative results on poverty and households' income. Thus, more focalized policies, such as direct cash transfers to households, might have better results in terms of cost-benefit.

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## Annex. Trade and macroeconomic indicators for Uruguay, 2004-2010

**Table A 1. Main trade indicators for Uruguay. 1997-2009**

	2001	2005	2007	2009
Trade Openness*	36.3	58.9	57.9	52.0
Main trade partners (% total trade)				
Mercosur	42.8	33.0	38.0	37.9
European Union	8.8	14.4	8.9	6.3
United States	18.8	13.9	13.5	12.3
China	4.4	5.0	8.4	11.2
Average external tariff**	11.9	9.4	9.2	9.3
Average intrazone tariff**	0.0	0.1	0.1	0.1
Export price index (annual percentage variation)	-3.6	2.7	12.6	-13.5

Source: own elaboration with data from Central Bank of Uruguay (national accounts), Chamber of Industries of Uruguay and Ministry of Economics and Finance.

Notes: \*Trade Openness = (Exports + Imports)/GDP\*100. All variables are at current prices.

\*\*Simple average

**Table A 2. Main export products for Uruguay: share in total exports and revealed comparative advantage, 2007**

HS2	Description	Share of total exports	Revealed Comparative Advantage Index (RCA)
02	Meat and edible meat offal	23.4	45.7
04	Dairy products, eggs, honey	9.4	17.0
10	Cereals	9.1	14.5
41	Raw hides and skins and leather	8.1	217.6
44	Wood and articles of wood	6.5	10.0
51	Wool and animal hair	6.2	78.5
12	Oil seed, ol. fruits, grain, seed, fruit, etc	6.0	34.0
87	Motor vehicles and parts	4.9	0.4
27	Mineral fuels, oils, distillation products	4.9	2.3
39	Plastics and articles thereof	4.9	2.1
03	Fish, crustaceans, molluscs	4.1	8.4
11	Milling products, malt, starches, wheat gluten	2.5	64.0
08	Edible fruit and nuts	2.3	7.0
71	Pearls, precious stones, metals, coins, etc	2.2	4.3
30	Pharmaceutical products	2.0	0.5

Source: Own elaboration with data from Central Bank of Uruguay and Comtrade

**Table A 3. Uruguay: Balance of payments and GDP (in millions of USD)**

	2004	2005	2006	2007	2008	2009	2010
<b>Current Account</b>	<b>3.1</b>	<b>42.3</b>	<b>-391.9</b>	<b>-220.5</b>	<b>-1729.0</b>	<b>-91.6</b>	<b>-446.4</b>
Exports	4,257	5,085	5,787	6,933	9,372	8,637	10,607
Imports	3,778	4,693	5,877	6,775	10,333	7,979	9,861
Net Rent and Transfers	-475	-350	-302	-378	-588	-551	-1,192
<b>Capital Account</b>	<b>72.1</b>	<b>752.1</b>	<b>528.0</b>	<b>1505.2</b>	<b>3097.6</b>	<b>1380.4</b>	<b>1520.7</b>
Foreign Direct Investment	332.4	847.4	1493.5	1329.5	2105.7	1619.9	2483.1
Portfolio Investment	-422.2	805.9	1686.4	1150.5	-557.7	-716.1	-547.7
Other Investment	174.4	-868.8	-2659.4	-889.1	1538.5	492.9	-458.6
<b>Errors &amp; Omissions</b>	<b>379.1</b>	<b>-174.1</b>	<b>-151.5</b>	<b>-279.3</b>	<b>863.7</b>	<b>299.5</b>	<b>-1435.1</b>
<b>Reserves</b>	<b>-454.3</b>	<b>-620.3</b>	<b>15.4</b>	<b>-1005.4</b>	<b>-2232.4</b>	<b>-1588.3</b>	<b>360.8</b>
<b>GDP</b>	13,686	17,363	19,802	23,877	31,177	31,322	40,265
<b>Ratio CA/GDP</b>	0.0%	0.2%	-2.0%	-0.9%	-5.5%	-0.3%	-1.1%
<b>Ratio FDI/GDP</b>	2.4%	4.9%	7.5%	5.6%	6.8%	5.2%	6.2%
<b>Real Exchange Rate*</b>	139.9	126.5	125.0	123.3	112.1	107.8	97.7

\*Index 2000=100

Source: Central Bank of Uruguay