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LESSONS FROM THE 2008 FINANCIAL CRISIS: POLICY RESPONSES TO EXTERNAL SHOCKS IN URUGUAY

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The 2008 global economic crisis affected the Uruguayan economy through two main channels: collapse in global trade and drop in capital flows. In response to the crisis, the Uruguayan government increased public consumption and investment and expanded social benefits to unemployed workers. We apply a computable general equilibrium model linked to microsimulations to analyze the distributional impacts of these policies and assess their effectiveness. We find that an increase in public investment was the only policy effective in mitigating the negative impact of the crisis on extreme poverty. The other policies reinforced the negative impact of the crisis on the poor. All three policies are costly and have an important impact on macroeconomic variables and the structure of production and export, while they have only slight or negative results on poverty and household income. More focalized policies, such as direct cash transfers, might have better results in terms of cost-benefit.

Keywords: Financial crisis; Trade shock; Policy response; Unemployment; Uruguay
JEL classification: D58, F42, G01, H50, I32

I. 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 by 2.3% in 2009 and global exports experienced the deepest fall since the Great Depression in the 1930s (Baldwin 2009). The epicenter of the crisis was the developed economies' financial systems, mainly those in the United States and Europe, but these countries' financial and economic links with the rest of the world soon transmitted the crisis to developing countries. The main channels of transmission have been discussed extensively: (1) collapse in global trade and fall in

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international prices; (2) drop in capital flows, affecting foreign direct investment (FDI) and equity investment; (3) fall in remittances; and (4) fall in aid flows (Willem te Verde 2008; World Bank 2009). In the case of Uruguay, the two former channels seemed to have played a more important role than the latter two.

The first channel, collapse in global trade, is particularly important for Uruguay. Uruguay is a small, open economy with relatively low protection levels that is integrated into MERCOSUR, a regional trade bloc composed of Argentina, Brazil, Paraguay, Venezuela, and Uruguay. 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 accounted for almost 63% of the country's total value of exports in 2007. Demand for food products is usually less elastic to changes in income than demand for manufactured or durable goods; as Freund (2009) has estimated, exports of food and beverages have been less impacted in the context of past global crises. Given that Uruguayan exports are highly concentrated in food products, the 2008 crisis might be expected to have had a lower impact on Uruguayan export volumes. However, there are two indirectly associated effects that could have resulted in larger real impacts on Uruguayan exports. The first is the impact of the crisis in the larger MERCOSUR region, particularly Brazil, the main destination of Uruguayan exports. Uruguayan manufactured exports are highly concentrated in the MERCOSUR region; thus, the effects of the crisis could indirectly impact the manufacturing sector if the main MERCOSUR partners were more severely hit.[1] Second, the crisis might also have had an effect on global trade policy decisions in the developed economies, with subsequent increases in protectionist levels that might have also amplified the effect of the crisis in Uruguay.

The second channel of transmission, a drop in capital flows, 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 global 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 was reflected in the fall of portfolio investments, which are usually the most volatile category of the capital account of the balance of payments. FDI flows were also affected during the crisis. FDI had shown an impressive growth between 2005 and 2008, increasing from 2.4% of gross domestic product (GDP) in 2004 to 5.7% of GDP in 2008.

[1] Mordecki and Piaggio (2008) show that manufacturing exports not based on agricultural inputs, which are destined mainly to Argentina and Brazil, depend to a larger extent on the growth of the two regions than on bilateral exchange rate variations.

After the crisis, FDI stagnated and in 2009, the FDI/GDP declined to 3.8%, which represented a fall of US$5.5 billion from 2008.[2]

As a reaction to their balance of payments contraction, several countries depreciated their currencies. Depreciation was also a consequence of depressed international prices. The real exchange rate in Uruguay also depreciated in the first half of 2009 but recovered during the second half of that year. By the end of 2009, there was real exchange rate appreciation compared to 2008.

As a consequence of the 2008 crisis, and after six years of steady GDP growth rate following the 2002 recession, Uruguay showed the first decrease (–2.9%) in real GDP during the first quarter of 2009. Although GDP immediately recovered during the second quarter of 2009, there was a substantial slowdown of overall 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 prior to the crisis predicted the fiscal deficit at –0.4% of GDP for 2009, the fiscal deficit reached –1.7% of GDP in 2010. This declining growth has potential negative implications for income, employment, investment, and poverty in the country. The negative impact on poverty is reached through two mechanisms: a fall in labor demand, implying an increase in unemployment and a fall in wages, and 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 to be a significant source of vulnerability, and the government allowed an increase in public deficit rather than cutting government spending. Public consumption and investment increased 9.4% and 29.5%, respectively, in real terms in the first half of 2009, implying a countercyclical movement. As Ocampo (2011) shows, Uruguay was among the leading Latin American countries with high public expenditures as percentage of GDP during the crisis, which might have been one of the factors that explain the relatively good performance of the economy in the period.

In addition, some "automatic devices" turned on in the downward economic cycle, such as unemployment insurance. Most studies up to 2005 indicate a relatively low coverage of unemployment insurance in Uruguay owing to the persistence of informal employment. However, in the last years, formal employment has increased considerably, mainly due to the reinstallation of collective wage bargaining. Thus, reasonably, unemployment insurance coverage is expected to act as a

[2] The other two channels of transmission, remittances and aid flows, are not significant in the case of Uruguay. Neither of these flows has represented more than 1% of GDP in the last decade. Aid flows to Uruguay actually increased during 2009, both in absolute terms and relative to GDP; even though remittances fell in 2009, the decline was slight.

compensatory policy for a larger proportion of workers than it did prior to 2005.[3] Furthermore, as a compensatory policy during the crisis, the government temporarily extended the period of unemployment insurance coverage and modified benefit rates.[4] 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 2008 global financial crisis on the Uruguayan economy, placing special emphasis on analyzing its distributional impacts and the effect on poverty. It also seeks 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, which has been exposed to several external shocks in the last 20 years and could again be affected in the case of a new global crisis. In this sense, it is important to identify the main sources of vulnerability in the Uruguayan economy and to assess whether public interventions can 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.

To our knowledge, there are no other evaluations of the impact of the crisis on Uruguayan poverty and inequality to date. Nor are there any evaluations of public policies implemented by the Uruguayan government during the crisis. The existing studies that analyze the impact of public social expenditure in income distribution in Uruguay deal with periods prior to the crisis (Llambí *et al*. 2010; Roca 2010). We find that most components of social expenditure in Uruguay are progressive, especially expenditure in health and primary education, and that as these components of public expenditure have increased in recent years, income distribution has also improved.

With regards to other economies, there are several studies that evaluate the impact of the economic crisis on different country's economies. In the case of Latin America, studies usually find that countries did not suffer a strong negative impact from the crisis, although performance is better in southern countries than in Central American countries, which depend more on remittances and trade with the United States. In the case of South American countries, the combination of weaker financial transmission channels and less direct impact of external trade and

[3] The unemployment benefit program consists of payments in cash to workers that have recently become unemployed. Typically, payments represent half of their nominal income, and are provided to the worker for six months, although the amount paid and the time frame may be modified by the government.

[4] Benefits were increased during the first months of the unemployment period and then gradually decreased (BPS 2010).

investment shocks, combined with a "new scheme of orthodox economic policy"[5] (Ocampo 2011) and greater space for both fiscal and monetary policy responses (Ferreira and Schady 2009) help to explain better economic performance compared to other regions in the world and to previous crisis episodes in the region.

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 usually applied to make ex ante evaluations, an ex post evaluation is interesting in this case because it allows us 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.[6] Another caveat of CGE models is that they lack a financial sector. However, as already pointed out, the main transmission channels of the crisis to Latin American countries were trade and investment, and thus lacking a financial sector does not represent a serious shortcoming in this case. Linking the CGE model with microsimulations also allows us to analyze the distributional impact of the crisis and the policy responses on Uruguayan households.

In the next section, we present the methodology applied in this paper. Section III analyzes the results obtained, and Section IV draws some conclusions.

II. MODEL AND DATASET

In this section, we first present the overall features of the CGE model applied in this paper. We apply a standard single-country model, but we introduce some modifications in order to consider some distinctive features of the Uruguayan economy and adapt the model to the objectives of this paper. We then present the nonparametric microsimulation methodology applied and the data used. Finally, we present the simulation scenarios designed for the purpose of this study.

A. *PEP Standard Model*

We apply the PEP standard model (PEP 1-1),[7] a single-country static model in which firms are assumed to operate under perfect competition. Output in each

[5] This consists of inflation targeting policies, flexible exchange rates, fiscal sustainability, adequate public debt profiles, and sustainable current account deficits (Ocampo 2011, p. 19).

[6] Many authors have chosen to analyze the ex post impact of the recent global crisis on domestic economies applying CGE models: see, for example, Cicowiez and Machicado (2010), Argüello (2011), and Wong (2012) for Latin American countries; Emini *et al*. (2010), Antwi-Asare *et al*. (2010), and Cockburn, Fofana, and Tiberti (2010) for African countries; and Strutt and Walmsley (2010) in a global setting.

[7] 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 of public access and can be accessed at http://www.pep-net.org/programs/mpia/pep-standard-cge-models/.

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 (constant elasticity of substitution) functions at the lower levels, which combine factors of production on one side and inputs from different origins on the other. Value-added is obtained through two nested CES functions. At the upper level, capital and composite labor are combined, while at the lower level, composite labor is obtained combining labor of different skill levels: unskilled, medium-skilled, and skilled labor. In this model, capital includes land.

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 (linear expenditure system)–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 contributions from households. The rest of the world receives payments for the value of imports, part of capital income,[8] 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 (constant elasticity of transformation) 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, as it is assumed that local products are imperfect substitutes for imports (Armington assumption). Thus,

[8] The total amount of income from capital is distributed among households, government, and the rest of the world according to a distribution parameter calibrated for the base year.

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 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.

The supply and demand equilibrium is verified in goods and services markets 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, the supply to the export market of each good is equal to demand.

A classical 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 agricultural sectors on one side and nonagricultural sectors on the other. Thus, there will be one rental rate of capital for each sector, and wages for each type of labor in the agriculture and nonagriculture sectors, respectively, all of them determined competitively. Consumer price index is the numeraire in the model.

B. *Modifications to the PEP Standard Model*

Some modifications are introduced in order to adapt the model to the Uruguayan scenario and to allow for the evaluation of policy responses to the 2008 crisis. First, we introduce 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 $\frac{\boldsymbol{W_l}}{\boldsymbol{PIXCON}}$ being the real wage of type l labor, $\boldsymbol{U_l}$ the unemployment level of type l labor, $\boldsymbol{A_{wc}}$ a scale parameter, and $\boldsymbol{\sigma_{wc}}$ the elasticity of wages to unemployment level.

$$\frac{\boldsymbol{W_l}}{\boldsymbol{PIXCON}} = \boldsymbol{A_{wc}} * \boldsymbol{U_l^{\sigma_{wc}}}, \tag{1}$$

This specification for the 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 turnover rates among workers. In a context of high unemployment, firms do not need to pay a high incentive since workers are more prone to losing 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 González (2007), who found a significant wage curve relation for unskilled and semiskilled workers, with estimated elasticity values of –0.145 and –0.139, respectively.[9]

Second, we do not consider firms as separate agents of the model. We make 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 only consider households, government, and the rest of the world as relevant types of agents for this analysis.

Third, we separate 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 is necessary in order to evaluate one of the public policies implemented by the government: an increase in public investment. With this modification, we now have three new equations in the model:

$$PC_i INV_i^{PRI} = \gamma_i^{INVPRI} IT^{PRI}, \tag{2}$$

$$PC_i INV_i^{PUB} = \gamma_i^{INVPUB} IT^{PUB}, \tag{3}$$

$$INV_i = INV^{PRI} + INV^{PUB}, \tag{4}$$

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. Thus, 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 fixed real government consumption and tax rates, such that savings equilibrate government accounts. This implies a change to the PEP model, as we assume 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 introduce a fourth modification, a new component of public transfers: unemployment insurance transfers, which are 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 automatically when unemployment increases (U_l),

[9] The authors did not find a significant effect of unemployment on wages for skilled workers.

and also if the government decides to manipulate the level of benefits through parameter α_{B_h}, which represents the initial value of benefits per household type.

$$B_h = \alpha_{B_h} * \sum_l U_l, \tag{5}$$

C. *Microsimulations*

In order to analyze the effect of some scenarios on poverty and income distribution, we complement the CGE analysis with microsimulations. We apply a nonparameteric microsimulation approach, as proposed and discussed in Vos *et al*. (2006) and Vos and Sánchez (2010). This is a top-down approach that takes the results of the CGE model and feeds them into a microsimulation module with data from the Continuous Household Survey for Uruguay for 2005.

We use results on key variables from the factor market in the CGE model, which are assigned randomly to individuals in the household survey, according to their initial characteristics. Specifically, we note changes in the following variables: unemployment rate by skill level, employment rates by skill level, average wage by sector of activity and skill level, average wage in the economy, and average return to capital. We use random numbers to determine which individuals in the household survey to attribute these changes. For example, if the unemployment rate falls by 10%, then 10% of unemployed workers will get a job, and their wages are adjusted accordingly. The individuals are selected randomly, under the assumption that, on average, the effect of the random changes correctly reflects the impact of the actual changes in the labor market. The microsimulations are repeated numerous times in Monte Carlo fashion, in order to allow the construction of 95% confidence intervals for the indices of inequality and poverty.

We feed CGE results as percentage changes of the mentioned factor market variables into the 2005 Uruguayan Continuous Household Survey. With these changes, we calculate the new income for each household and estimate the new values for the most common poverty indicators: the poverty headcount (the percentage of households below the poverty line), using the poverty line suggested by the National Institute of Statistics as a point of reference; the extreme poverty headcount (the percentage of households below the extreme poverty line); and the Gini coefficient, calculated with per capita income by household. Contrary to Ganuza *et al*. (2002) who kept the poverty lines constant, we also adjust the extreme poverty line according to changes in the food and beverage price index, also obtained through the CGE model.

This methodology still has some limitations. For example, we shock the weighted average rate of return to capital and not the sectoral rates, which would be more appropriate in a model in which we assume specific capital by sectors. This constraint stems from the way in which the information is collected in the

household survey, in which income from capital is not differentiated by sector. In spite of its caveats, this method is useful to track the impact of shocks and policies to the micro level. One advantage of the nonparametric method applied in this paper is that there is no need to reconcile the data from the SAM with data from the household survey.

D. *Data and Calibration*

For calibration purposes, we use a 2005 SAM for Uruguay based on the most recently published Tables of Supply and Use by the Central Bank of Uruguay. Given that the economic and trade structure of Uruguay did not experience significant changes between 2005 and 2008, we do not rebalance the SAM.

The SAM has 55 activities, six types of labor according to formal education (unskilled/medium-skilled/skilled)[10] and sector of activity (agricultural/nonagricultural), 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 services sectors. We adapt the 2005 SAM to the model requirements, mainly simplifying some accounts, such as taxes.

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

Households are disaggregated into five groups in the SAM, according to quintiles of income. Even though other criteria are usually recommended for classification of households (see Decaluwé *et al*. 1999), this classification is relevant for Uruguay because it allows for differentiating very distinctive patterns of income and consumption.[11] For example, households belonging to the poorest quintile receive their income mainly from transfers and unskilled labor wages, while households in the highest quintile 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 the 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

[10] In this study, we define unskilled labor as workers with 6 years or less of schooling, medium-skilled labor as between 7 and 11 years of schooling, and skilled labor as 12 years of schooling or more.

[11] Some of the criteria usually suggested are not relevant for the Uruguayan case. For example, the differentiation between urban and rural households, because rural households represent a very low percentage of households in Uruguay.

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 of international demand for exports	2	4
CES – Value added:		
Composite labor	0.8	1.6
Labor – capital	1.1	–
LES – CES parameters:		
Frisch	–2	–
Income elasticity food	0.7	–
Income elasticity other	1.1	–
Wage curve elasticities:		
Unskilled labor	–0.145	–
Semi-skilled labor	–0.139	–

Source: Authors' own elaboration.

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 (0.8) and labor and capital (1.1). We take the lower bound of the average Armington elasticity estimated by Flores and Cassoni (2009) for Uruguay; for the sensitivity analysis, we double this value. We assume the same value for CET elasticity of transformation between exports and local sales.

E. *Scenarios*

We simulate a benchmark scenario that seeks to replicate the main economic facts during the 2008 economic crisis. Two big scenarios comprise this scenario: one crisis scenario and one public policy scenario. The crisis scenario seeks to replicate the main transmission channels of the global crisis to the Uruguayan economy: (1) collapse in global trade and fall in international prices and (2) drop in foreign capital flows. The policy response scenario is composed of three different policies implemented by the Uruguayan government during the crisis: increase in public expenditure, increase in public investment, and increase in unemployment benefits.

The crisis scenario replicates the main shocks suffered by the Uruguayan economy during the global crisis: a trade shock and a fall in capital inflows. As

TABLE 2

Simulated Shocks in Manufacturing Export Sectors

Description	Share in Total Exports at Benchmark	Var Exports, Jan–June, 2008/ Jan–June, 2009 (%)	Shock (% variation)	Type of Shock
Meat processing	19.2	–28.5	–3.1	Price
Refined petroleum products and nuclear fuel	6.4	–46.2	–52.2	Price
Leather products	5.2	–41.8	–15.9	Price
Dairy products	5.2	–19.4	–51.9	Price
Sugar	5.0	44.3	–8.2	Price
Rice processing	4.2	35.8	–19.6	Price
Textiles	3.9	–34.7	–38.9	Price
Cereals and other primary	3.2	18.1	–29.3	Price
Fish products	2.9	3.3	–6.7	Price
Basic chemicals	2.8	–26.9	–1.0	Quantity
Rubber and plastic	3.0	–12.9	–1.0	Quantity
Metal products and machinery	2.8	–18.4	–1.0	Quantity
Passenger transport	9.8	n/d	–1.0	Quantity

Source: Central Bank of Uruguay (export values), IMF (commodity prices), Chamber of Industries of Uruguay (manufactures prices), USDA (dairy prices).

presented previously, 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 exports at the base year, eight sectors experienced a fall in export values between the first half of 2008 and the first half of 2009 (see Table 2). In some of these sectors, such as leather, wood, textiles, meat, and refined oil, the decline was significant. In such cases, exports in volume did not experience an important change; thus, we assume a price shock. For commodities, we take the price variation reported by the International Monetary Fund (IMF); for industrial goods, we take the export price indices reported by the Uruguay Chamber of Industry (CIU). Dairy prices are taken from the US Department of Agriculture. The IMF reports prices at a disaggregated level, and some of the sectors included in the SAM are composed of several different products. In these cases, in order to compute the price change for the whole sector, we estimate the weighted average price change of the different products that are included in each sector, using exports at the base year as weights.

In the case of most industrial nonfood 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 Uruguay's main trade partners, Argentina and Brazil, again using trade weights at the base year.

TABLE 3

Simulation Scenarios

Name	Brief Description of Scenario	Variable/ Parameter Shocked
Benchmark scenario (BENCH)	Crisis + PUBCON + PUBINV + UNBEN	
Crisis shock:		
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
Policy response shocks:		
Gov. consumption (PUBCON)	Crisis + 9.4% increase in real public consumption of commodities	CG
Public investment (PUBINV)	Crisis + 29.5% increase in real public investment	ITPUB
Unemployment benefits (UNBEN)	Crisis + 15% increase in unemployment benefit rate	$\propto_{B_h}$

Source: Authors' own elaboration.

Together with the negative price or demand shock on export sectors during the crisis, Uruguay also received a positive external shock as international prices of its main import commodities fell as a consequence of the crisis. Therefore, we also simulate the fall in international prices of oil, Uruguay's 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 take the reduction of FDI (the most important and structural part of capital inflows) to estimate the magnitude of the shock. FDI declined by 48% between June 2008 and June 2009 (Balance of Payments Statistics, Central Bank of Uruguay).[12] We simulate this shock via an equivalent reduction of the current account balance.

Table 3 presents in detail the design of the crisis scenario, the variables considered, and the magnitude of the variation we impose as a shock. It also presents three scenarios of policy response to the crisis that seek to replicate the main policy responses of the Uruguayan government. As noted previously, the government increased consumption and investment during the period of the crisis, allowing for a higher fiscal deficit. Thus, we simulate an increase in the two components of public expenditures, taking the real increase between June 2008 and June 2009.

[12] See http://www.bcu.gub.uy/Estadisticas-e-Indicadores/Paginas/Balanza-de-Pagos.aspx (accessed July 2011).

Public consumption increased by 9.4% and public investment by 29.5%. We simulate the increase in these two components separately in two different scenarios: PUBCON and PUBINV. 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, which implies lower public savings.

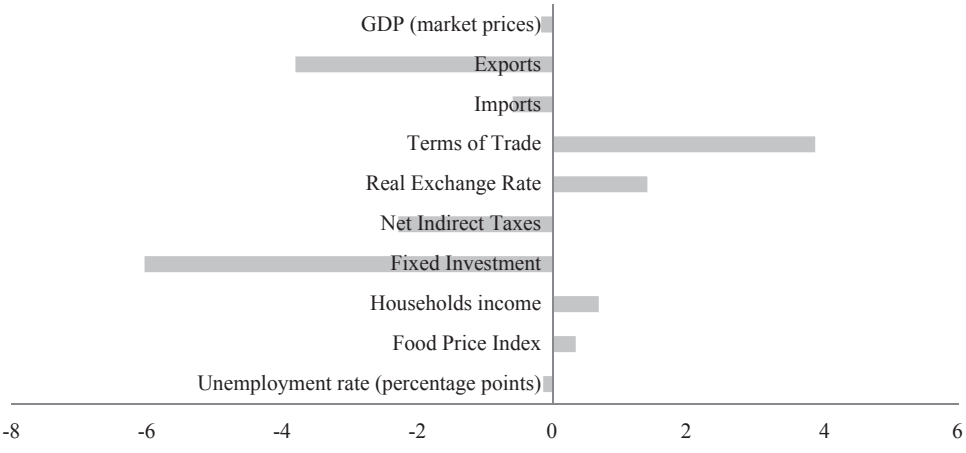
During the crisis, the Uruguayan government also increased the unemployment benefit rate by 15% (BPS 2010). Unemployment insurance acts as an automatic device for protecting vulnerable populations during downward economic cycles. The observed facts for Uruguay indicate a rise in unemployment insurance requests and in unemployment insurance coverage during the crisis climax (September 2008–March 2009). The increase in the unemployment benefit rate (the amount of benefits paid to unemployed workers) sought to reinforce this automatic protection device.

III. RESULTS

We first present and analyze the results of the benchmark scenario and we compare results with the counterfactual scenario of the crisis without policy responses, and then we focus on the effect of each policy response from the Uruguayan government separately.

Our model predicts the 2008 global crisis to have a negative impact on the Uruguayan economy, as presented in Figure 1. Results of BENCH scenario are close to the actual short-term impact of the crisis, when GDP, exports, and

Fig. 1. Impact of the Global Crisis on Uruguayan Economy (% variation)



Source: CGE results.

investment were negatively affected, and real exchange rate depreciated as a consequence of balance of payment constraints faced by the country. This scenario includes the effect of the crisis and the policy intervention. We will try to disentangle the effects of the main transmission channels of the global crisis on the one hand and the differentiated policies on the other.

A. *The Impact of the 2008 Financial Crisis on the Uruguayan Economy*

Tables 4 to 6 compare the effects of the scenarios simulated on macroeconomic variables, production by sectors, and the labor market, respectively. All results are shown as percentage changes with respect to the base year. The CRISIS scenario seeks to simulate how the effect of the global crisis would have been without policy intervention. The main transmission mechanism of the global crisis to the economy

TABLE 4

Impact of Policy Response on Macroeconomic Variables (% variation)

	BENCH	CRISIS	PUBCON	PUBINV	UNBEN
National accounts:					
Private consumption	0.92	0.89	0.86	0.94	0.83
Fixed investment	–6.03	–0.09	–5.55	–0.26	–0.46
Government consumption	9.40	0.00	9.40	0.00	0.00
Government savings	–17.49	–1.09	–16.81	–0.98	–1.67
Exports	–3.80	–2.66	–3.60	–2.84	–2.69
Imports	–0.59	0.35	–0.23	0.09	0.03
GDP (market prices)	–0.17	–0.18	–0.19	–0.16	–0.22
Net indirect taxes	–2.28	–1.71	–2.24	–1.72	–1.81
GDP (factor cost)	0.15	0.05	0.13	0.08	0.03
Prices:					
Food price index	0.34	0.58	0.34	0.58	0.62
Real exchange rate	1.40	1.59	1.30	1.65	1.76
Terms of trade	0.53	3.94	0.40	–0.48	–0.21

Source: CGE results.

TABLE 5

Impact of Policy Response on Sectoral Production (% variation)

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

Source: CGE results.

TABLE 6

Impact of Policy Response on Labor Market (% variation)

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

Source: CGE results.

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 by 6.1%, while the effect on volume is less pronounced at –2.7%. The fall in exports leads to a decrease in production and factor demand in main agricultural export sectors and light manufactures sectors. The sectors that are most hard hit are dairy, cereals, textiles, and leather. On the other hand, some sectors benefit from a fall in oil prices and their production is boosted. This is the case for some industrial sectors, such as chemicals, and services, such as transport.

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

In the labor market, unskilled workers are negatively affected, especially those employed in agricultural sectors. Their real wages fall and unemployment

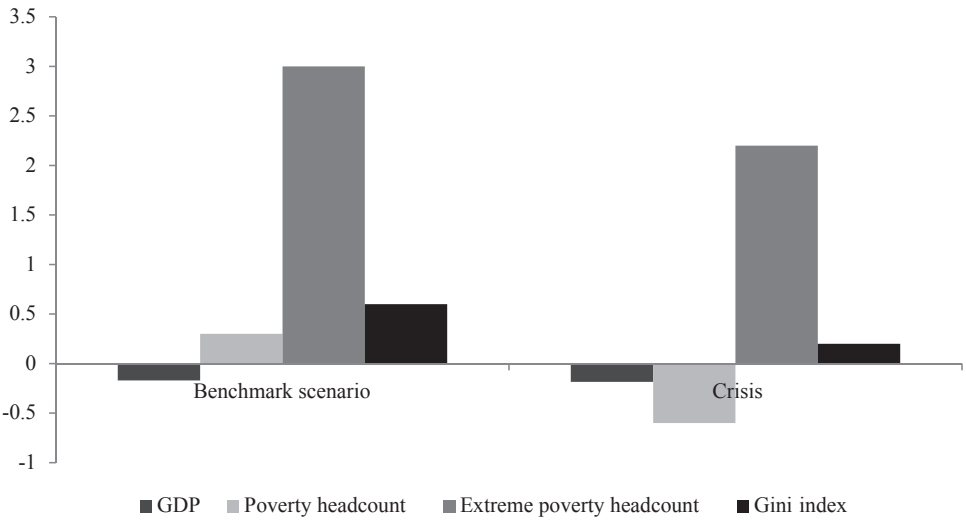
increases. Medium-skilled and skilled workers benefit slightly due to the expansion of some industrial and service sectors, which explains the fall in the unemployment rate among semi-skilled workers, as well as the increase in average households' income and the fall in poverty rates. However, unskilled workers constitute the most vulnerable segment of the 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 the actual response of the Uruguayan government was in preventing a negative impact on poverty.

B. *Policy Responses*

1. *Overall effect*

In this section, we discuss the alternative policy instruments applied by the Uruguayan government during the 2008 crisis. Figure 2 compares the effect on GDP and poverty indicators both with and without policy responses. The government response has a slight positive effect on GDP, which falls slightly less than under the CRISIS scenario. On the other hand, the policies implemented have a negative effect on poverty and income distribution.

Fig. 2. Impact of Crisis and Policy Response on GDP, Poverty, and Income Distribution (% variation)



Source: CGE and microsimulation results.

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 of these policies next.

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 present the effects of these policies. It should be noted that all policy effects also include the effects of the crisis.

The increase in public expenditure by 9.4% in real terms (PUBCON) has a very slight effect on GDP, which falls 0.01 percentage points more than under the crisis scenario (Table 4). 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 (over 5.5 percentage points more than in the crisis scenario), due to the fall in public savings. The increase in demand from the public sector is mostly for nontradable 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 manufacture 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 export competitiveness. On the other hand, the government consumption expansion translates into a significant increase in public services, education, and health, as public consumption is concentrated in these activities. This has a strong positive impact on the relative remuneration of workers. Skilled, nonagricultural workers employed in education and health sectors benefit from this policy, while unskilled workers are hurt as the construction sector and traditional exporting sectors contract. As a consequence of the crisis, unemployment for unskilled workers in the agricultural sector increases; as a consequence of the government intervention, unemployment increases among all types of workers except semiskilled, nonagricultural 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 contrarily to this latter policy, the impact is mostly positive: GDP falls less and private consumption increases more. However, owing to external finance restrictions faced by the country, the increase in public investment cannot

be financed with external savings and 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 for financing public investment, such as foreign borrowing. In that case, the crowd-out effect would not necessarily take place in the short (or medium) term. 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 benefit: wages rise and unemployment falls.

The UNBEN scenario simulates an increase in the unemployment benefit rate paid by the government. This policy reduces government savings and consequently has a negative impact on investment, a 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%, similarly to the crisis scenario with no policy response. However, this policy has a distinct positive impact on the agricultural sector. The 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 nontradable goods. Consequently, workers employed in the agricultural sector benefit from higher wage increases or declines in unemployment with respect to the crisis scenario, while workers in the nonagricultural sector, mostly services, are harmed.

3. *Impact on households' welfare and poverty indicators*

Of the three policies implemented by the government, only the increase in public investment increases welfare and income for all households except the richest; the benefit is higher for poorer households. The rest of the policies reinforce the regressive impact of the crisis on households' income. However, it should be noted that we are not capturing some of the welfare benefits to households brought about by an increase in public expenditure. We might expect that poor households are the ones that benefit the most from an improvement of public services like education and health, as Llambí *et al*. (2010) and Roca (2010) show. However, the model does not consider the existence of a public good in the households' utility function.

These conclusions 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 for mitigating the negative impact of the crisis on extreme poverty is an increase in public investment. In spite of this, this policy still has some negative effects on the economy, as public investment crowds out private investment. This might have a negative impact on growth in the long run.

TABLE 7

Impact of Policy Response on Welfare, Income, and Poverty Indicators
(thousand 2005 US dollars and % variation)

	BENCH	CRISIS	PUBCON	PUBINV	UNBEN
Welfare:					
Poorest quintile	–6,490	–5,381	–8,189	–4,089	–5,692
Second quintile	6,056	6,773	3,691	8,639	5,884
Third quintile	13,227	12,885	10,921	14,524	11,786
Fourth quintile	24,965	22,863	22,882	24,117	21,244
Richest quintile	60,458	58,203	60,681	57,776	54,083
Real income:					
Poorest quintile	–0.34	–0.15	–0.49	–0.04	–0.17
Second quintile	0.29	0.38	0.16	0.49	0.33
Third quintile	0.64	0.63	0.53	0.71	0.57
Fourth quintile	0.86	0.76	0.78	0.81	0.70
Richest quintile	0.97	0.90	0.97	0.90	0.82
Poverty indicators:					
Extreme poverty	2.97	2.17	4.00	1.14	2.22
Poverty	0.27	–0.58	0.43	–1.01	–0.36
Inequality	0.59	0.18	0.71	0.08	0.19

Source: CGE and microsimulation results.
Note: Welfare is measured by changes in equivalent variation.

The three policies are very costly and have an important impact on macroeconomic variables and the structure of production and export, while they have only slight or negative results on poverty and households' income. Thus, more focalized policies, such as direct cash transfers, might have better results in terms of cost-benefit. In the next section we present the effect of two alternative policies that could have been implemented by the Uruguayan government.

C. *Impact of Focalized Policies*

In this section we present the results of two focalized polices that, even though they were not implemented by the Uruguayan government during the crisis, they have been applied before and could be applied again in the future. Specifically, we simulate the impact of a cash transfer program to poor households (first and second quintile of income) and subsidies to production in affected sectors by the crisis (rice, cereals, fruits and vegetables, dairy, and meat production). We simulate a 20% increase in public transfers to poor households (CASH TRANSFER scenario) and a 10% subsidy to affected sectors (SUBSIDY scenario).[13] Table 8 presents results under the two scenarios and compares them with the BENCH scenario.

[13] Each of these two policies represents a similar cost to the government than the UNBEN policy, and is less costly than PUBCON or PUBINV.

TABLE 8

Impact of Focalized Policies (% variation)

	Benchmark Scenario	Cash Transfer Program	Subsidy
GDP	–0.2	–0.3	–0.3
Exports	–3.8	–2.8	–2.8
Imports	–0.6	–0.4	–0.5
Investment	–6.0	–1.1	–1.1
Real exchange rate	1.4	2.0	2.0
Terms of trade	3.9	3.0	2.9
Unemployment rate	–0.1	0.5	0.0
Poverty	0.3	–0.1	–0.3
Extreme poverty	3.0	–12.1	2.9
Inequality	0.6	0.0	0.2

Source: CGE and microsimulation results.

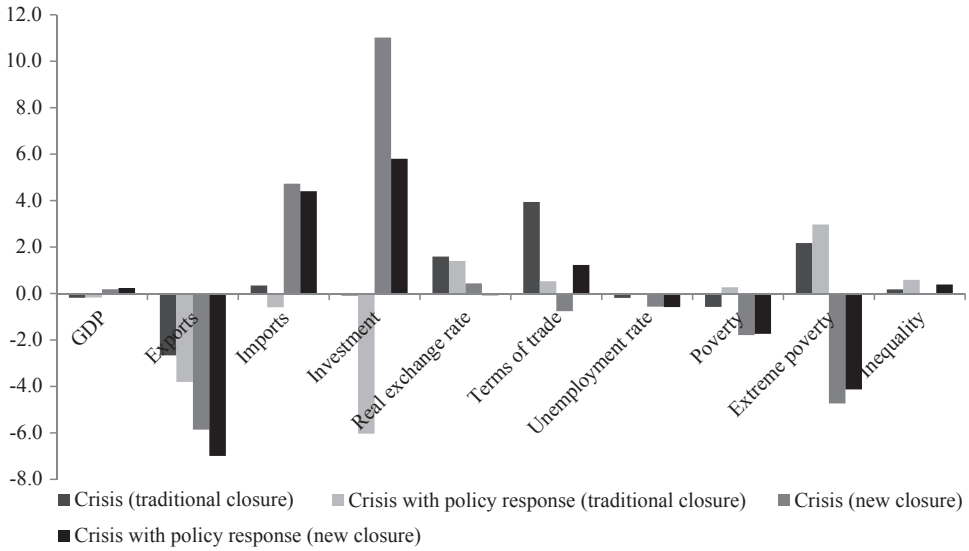
The impact of the CASH TRANSFER scenario on extreme poverty is noteworthy: as the policy directly targets poor households, the effect on their income is direct and extreme poverty falls significantly. Poverty also falls under this scenario. The SUBSIDY scenario boosts production of subsidized sectors but it does not prevent a fall in exports in those sectors. The macroeconomic impact of these policies is not positive: investment falls as public deficit increases, and this negatively affects GDP and unemployment. Thus, they might be considered valid short-term policies to prevent a vulnerable population from suffering the negative effects of the crisis, especially the cash transfer program.

D. *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 drives results strongly, as there are no options to finance the increased government consumption, investment, and transfers. If we loosen this assumption, we can consider other financing options, such as increasing external public debt (a policy which was actually used by the Uruguayan government). Indeed, the economy substantially lowered the debt–GDP ratio 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 under the alternative assumption for the crisis scenario (fall in export and import prices, fall in export demand) and the crisis scenario with policy response.

As Figure 3 shows, allowing for an increase in external financing strongly affects results. It should be noted that we are not only changing the closure, we are

Fig. 3. Comparison of Main Indicators Allowing for Foreign Debt Increase (% variation)



Source: CGE and microsimulation results.
Note: Unemployment rate is expressed as change in percentage points.

also changing the crisis scenario since the country no longer faces an external financing restriction. Thus, the negative effect on investment of a fall in FDI flows captured by the traditional scenario no longer takes place. Now, under the crisis scenario, investment increases and GDP increases slightly.

Policy responses do not have a positive effect under this alterative closure. The crisis, as it does not have a financial restriction component, only affects 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 slightly improves GDP growth. Fall in unemployment and poverty is less pronounced when there is a policy intervention.

E. *Sensitivity of Results to Elasticity Values*

Table 9 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

TABLE 9

Comparison of Main Indicators with Base Parameters Values, New Trade Elasticities Values, and New Elasticity of Labor Demand (% variation)

	Base Parameters		Change Trade Parameters		Change Labor Substitutability	
	CRISIS	BENCH	CRISIS	BENCH	CRISIS	BENCH
GDP	–0.2	–0.2	–0.2	–0.2	–0.2	–0.1
Exports	–2.7	–3.8	–4.7	–5.8	–2.6	–3.7
Imports	0.3	–0.6	0.1	–0.9	0.4	–0.5
Investment	–0.1	–6.0	0.5	–5.6	0.0	–5.9
Real exchange rate	1.6	1.4	1.4	1.2	1.6	1.4
Terms of trade	3.9	3.9	5.6	5.7	3.6	3.8
Unemployment rate	–0.2	–0.1	–0.4	–0.4	–0.2	–0.3
Poverty	–0.6	0.3	–1.3	–0.5	–0.7	–0.4
Extreme poverty	2.2	3.0	–2.7	–0.6	1.1	1.2
Inequality	0.2	0.6	0.1	0.6	0.1	0.3

Source: CGE and microsimulation results.

flows react more swiftly to the external shock—exports fall more and the real exchange rate depreciates more. This boosts production of other exporting and nontradable sectors; thus, wages increase more for nonagricultural workers. As the average income increases, so do private savings, and total investment increases. Poverty indicators perform better than under the base values of parameters: poverty and extreme poverty falls, and income distribution worsens but slightly less. 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, who then 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 interventions have a positive effect on GDP, unemployment, and poverty.

IV. SUMMARY AND CONCLUDING REMARKS

The Uruguayan economy recovered promptly from the 2008 global crisis; in 2010, the country's real GDP increased by 8.5%. However, our simulations suggest that

the crisis had a short-term negative impact on the economy, and those most negatively affected were the country's poor. This fact highlights the importance of specific policies aimed at counteracting the negative impact of external shocks on the most vulnerable population.

This paper used 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 was on the trade and foreign flows channels, since these were the most important mechanisms through which the global crisis hit the Uruguayan economy. Thus, we mainly simulated the crisis through price reductions of key export and import sectors, a demand reduction coming from the country's main trade partners (Argentina and Brazil), and a foreign savings restriction via a cut in the current account balance. We also tested how three distinctive policy responses by the Uruguayan government (increase in public consumption of 9%, increase in public investment of 30%, and increase in coverage rate of unemployment benefits of 15%) were effective in counteracting the negative effects of the crisis.

We find that the crisis has a negative impact on exports and fixed investment, a 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. The 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. This might have a negative impact on growth in the long run. An increase in public consumption benefits richer households, as public consumption is focalized in sectors that employ more intensively skilled labor. Thus, the policy not only does not tackle the problem of an increase in extreme poverty directly, it also has an indirect negative effect. As total investment falls under this policy, extreme poverty increases. Finally, an increase in unemployment benefits has an unexpected indirect positive effect on the agricultural export sectors and benefits unskilled workers; however, it is not strong enough to reduce extreme poverty.

The three policies are very costly and have an important impact on macroeconomic variables and the structure of production and export, while they have only slight or negative results on poverty and household income. Thus, more focalized

policies, such as direct cash transfers targeted directly to vulnerable populations, might have better results in terms of cost-benefit.

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